The keys to success of bull breeding soundness exams

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Abstract

Bull breeding soundness exams are one of the most important tasks that we perform as bovine veterinarians. This exam is designed to identify subfertile and infertile bulls which if used in a breeding scenario can result in loss of dollars for the producer. This loss of income comes from reduction in calves hitting the ground, a longer calving season, and in total less pounds of calf at the time of weaning.

Introduction

Bull breeding soundness exams are complex in the fact that we take in multiple factors to determine the potential breeding status of a bull including physical exam, scrotal circumference, sperm motility and morphology. In this talk we will discuss some of the most challenging pieces of the exam for recent graduates and look at potential keys to success.

Some bulls are hard for me to collect or extend

Erection, protrusion, and ejaculation are all controlled by the amount and pattern of stimulation applied either manually or by electroejaculation. Often a combination of the 2 methods.

Equipment

Good equipment is vital to making sure that the breeding soundness exam goes well. One of the most critical pieces of equipment is a trustworthy ejaculator system including the control box, probe and cord. There are several electroejaculators available on the market, each with some differences in operation and potentially in bull response. Some models incorporate a rheostat to allow manual control of the application of stimulation to control frequency, duration and magnitude of voltage utilized to stimulate the bull to ejaculate. Other electroejaculators offer preprogrammed computerized settings to apply stimulation in standardized patterns. At least one supplier has a model that allows the selection of either manually controlled stimulation or programmed patterns.

Electroejaculation requires the transrectal application of an electrical stimulus to the pelvic reproductive organs, which is accomplished by placement of a probe in the rectum. Limiting electrode location to the ventral surface of the probe restricts the area of electrical contact and avoids stimulation of non-target tissues. Most probes currently on the market have 3 ventrally oriented electrodes and recently a model utilizing only 2 ventral electrodes has been introduced. Probes are readily available in 3 diameters: 60, 75 and 90 mm. Larger diameter probes produce better electrical contact within the rectum and produce stronger responses to stimuli of a given electrical output when compared to probes of smaller diameter. For best results, use the largest probe size that the bull's rectum will comfortably accommodate. For most bulls weighing 1,200-2,000 pounds, 60 or 75 mm probes are appropriate. Some larger, older bulls may respond weakly to a medium-sized probe and in such cases, the use of the 90 mm probe will increase the likelihood of providing adequate stimulus to induce penile erection, protrusion and ejaculation. Some operators feel that the larger 90 mm probes seem to work best in *Bos indicus* and *Bos indicus*-influenced breeds.

The degree of electrical contact can be influenced by probe weight. Weighted probes are available and offer the advantage of allowing the probe to rest more firmly on the ventral rectal mucosa to improve electrical contact with pelvic genitalia. Probes often have U-shaped yoke as an extension on the back of the probe. After the probe is placed in the rectum, the bull's tail should be placed in the yoke, to aid in preventing displacement from the rectum and ensure the ventral orientation of the electrodes within the rectum. This yoke may be horizontal or oriented with the opening of the "U" pointed upward. A strong pole is often placed behind the hindquarters during collection and if the bull attempts to lie down, the horizontally oriented yoke could intersect with the pole, forcing the cranial aspect of the probe downward which could damage the rectum. This risk can be minimized using an upward-facing yoke. The electrodes of the probe should be cleaned with a scrub pad to remove any film that accumulates on the electrodes.

If the operator perceives that the stimulation appears intermittent or inappropriate for the stimulation applied the cord should be exchanged for a new one. The cords are often the culprit if a machine appears to be working inappropriately.

Stimulation and collection technique

Before insertion of the electroejaculator probe, the internal genitalia should be examined by transrectal palpation. A thorough exam is facilitated by manual removal of at least most of the feces from the rectum before the systematic palpation begins. Following the evaluation of the accessory sex glands and inguinal rings, the hand should remain in the rectum and the pelvic urethra, prostate and ampullae massaged with the fingertips for approximately 30 seconds, using a back-and-forth motion. During this massage, pulsations of the urethral muscle will be felt by the operator, the prepuce will relax and begin to evert, and the distal tip of the penis may protrude. The emission of a few drops of pre-seminal fluid is common.

Following the internal examination and massage, the arm should be removed from the rectum and the lubricated rectal probe inserted as smoothly as possible. Once the probe is properly positioned and the electrical cord is connected to the probe, stimulation of the pelvic genitalia may begin. Individual bulls may require different stimulation patterns for best results and adjustments to the stimulatory pattern and magnitude may be necessary. Initial stimulations should be at the lowest

available power setting and the amplitude of each successive pulsation increased slowly, allowing the bull to ease into the process of electroejaculation. The bull's movement in response to stimulus should not be jerky and he should slowly begin to start rocking forward as the intensity is increased.

In machines without preprogrammed stimulation patterns or when utilizing the manual mode in automated electroejaculators, the power within each step is controlled by a hand-operated rheostat. Manipulation of the rheostat knob should be smooth and rhythmic, never jerky. The intensity of the initial stimulation may be increased slowly until the bull indicates a minimal response to stimulation. The stimulation should then be released and re-applied in a stepwise fashion, with each successive stimulation slowly increasing in intensity. The rheostat is rotated further with each stimulus until the maximum intensity for each power setting is reached. If the stimulation amplitude is increased too rapidly, the chance of pre-erection ejaculation within the prepuce increases, resulting in contamination of the semen as it drips out of the preputial orifice. When properly applied, electroejaculation should result in the bull progressing sequentially through the processes of protrusion, erection and ejaculation and one should assume that an increase in power is warranted when the bull "stalls" and does not make continued progress through this expected series of events. Penile protrusion is primarily dependent on the rate and rhythm of stimuli, whereas semen emission largely depends on achieving sufficient intensity of the electrical stimulation. A rapid, smooth rhythm of increasing stimuli, each rising and falling within 2 to 3 seconds, such that the bull engages in a rocking motion, seems most successful. It is important to allow for a short (half-second) rest at zero stimulation following each rise and subsequent fall, to allow the retractor penis muscles to relax, as spasm of these muscles may inhibit protrusion of the penis. Once penile protrusion occurs, the stimulation phase can be somewhat longer, with ~2 seconds of stimulus, 1 second for reducing the stimulus to zero, and a half-second pause before starting the stimulus again. If the bull fails to extend the penis, an assistant may need to assist by pushing on the sigmoid flexure caudal to the scrotum.

Questions while classifying motility and morphology

This is a large topic to tackle in our short presentation today. Some helpful things are to set ourselves up for success in this arena prior to starting. Have all slides, coversli, and pipettes on a warming plate. Induction of cold shock certainly can impede motility and cause iatrogenic morphology defects such as bowed midpieces. Whether you are using bright field microscopy or phase contrast, know the limitations of your media. Eosin-nigrosin can go bad and buffered formal saline will cause clumping of slides. Even phosphate buffered saline can become hypo-osmotic in certain conditions. Don't compromise on reading morphology slides at 1000x under oil immersion. If you don't want to do this in the field, label the slide with a pencil or permanent marker and take them back to the clinic. Multiple studies have shown that far more bulls fail morphology than motility.

What do I do with the dreaded bull that is between 69-71% normal morphology?

When these bulls occur, recount but count 300-500 cells to make sure that you develop an accurate assessment of the bull's spermiogram. Also, make sure that you are reading the entirety of the slide. I think about splitting the slide into quadrants and reading equally in each quadrant. This ensures we give the bull the benefit of the doubt. Those that are still sitting at the cutoff are often bulls that we will defer and recheck. If they make no improvement at the time of recheck, then that bull is discussed with the owner as one that is subfertile. I find that when the defects are shown to the owner and a conversation is had regarding why that bull is subfertile, owners are very receptive to recommendations.

How do I know whether I should check defer vs. unsatisfactory?

In my opinion, majority of bulls that I test that do not meet the criteria to be marked as satisfactory are marked as deferred. Some scenarios where a bull is marked as unsatisfactory and not recommended for recheck.

- Musculoskeletal injuries such injury to the hock or stifle.
- Bulls that are suffering from a scrotal, penis or preputial injury and are not a surgical candidate.
- Bulls that are producing high number of pyriform heads, knobbed acrosomes are other morphologic defect with no other indicators of abnormal spermatogenesis.
- Bulls that are 2 years of age or older and do not meet minimum scrotal circumference requirements.
- Older bulls that have tested multiple years and have had a steady decline in normal sperm morphology to the point they no longer pass.

All other bulls are classified as deferred and recommended for recheck in 4-6 weeks.

References

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