

# Effective use of Breeding Soundness Examination to Maximize Stallion Fertility and Progeny Quality

Muhammad Irfan<sup>1</sup>, Qudsia Akram<sup>1</sup>, Muhammad Bilal Arshad<sup>1</sup>, Muhammad Ahsan<sup>1</sup>, Hasnain Idrees<sup>1\*</sup>

1. Faculty of Veterinary Sciences, University of Agriculture, Faisalabad.

\*Corresponding Author: <mailto:hidrees@murraystate.edu>

## ABSTRACT

The breeding soundness examination (BSE) is crucial for the fertility of the stallion and quality of the progeny. This article covers the detailed sequence of the breeding exam. It starts with the study of the breeding records and any reproductive concerns related to the breeding. Optimal stallion fertility and high-quality progeny depend on the breeding soundness assessment (BSE). This article highlights BSE's holistic approach, which includes several important aspects. Starting with a thorough stallion reproductive history and precise identification is the analysis's foundation. This includes breeding records, reproductive issues, and pedigree evaluation. BSE entails a complete general physical examination of the stallion to determine its health and conformation. Genitalia and reproductive organs are then examined. Libido and mating behavior are important because a stallion's sexual drive affects breeding success. Semen analysis requires semen collection and assessment. Sperm quantity, quality, and motility are assessed using advanced methods.

### 1. Introduction:

The goal of the Breeding Soundness Exam for Stallions is to evaluate the stallion's health and temperament to ensure that it can generate an adequate quantity of healthy sperm for artificial insemination or natural mating without transmitting infectious diseases [1]. There are four stages of testing that determine whether or not a stallion will be used for breeding:

- Reproductive history and identification of the stallion
- General physical exam
- External and internal reproductive examination
- Observation of libido and mating behaviour
- Semen collection and evaluation

### 2. History and identification of the stallion:

Before conducting an examination, it is imperative to ensure that each stallion is accurately and affirmatively recognized. This entails recording essential information such as the stallion's registration identity and number, age, and breed. It is important to document various distinguishing characteristics of a stallion, such as coat color and markings, lip tattoos, microchip details (if applicable), body branding, hair whorls, permanent scars, and any other distinctive traits. The addition of a digital image into the permanent medical record has potential value. The objective is to establish a reliable association between the outcomes of a breeding soundness examination (BSE) and a particular stallion, enabling future identification if required [2]. It is important to have a comprehensive breeding history in order to assess a stallion's prior fertility level, since past breeding outcomes, including conception and foaling rates, serve as the most reliable indications. The data collected includes the quantity and categorization of mares bred throughout each reproductive cycle, including maiden mares, barren mares, and foaling mares. Additionally, the breeding technique used is documented, which encompasses hand breeding, pasture breeding, as well as artificial insemination using fresh, chilled, or frozen semen [3]. The findings from prior to reproductive assessments, medical ailments, immunization records (particularly for horse arteritis virus), and other pertinent details are documented. Additionally, it is crucial to document the planned future use of the stallion and the estimated number of mares for the next season, as this information has significance in providing breeding management advice [2].

### 3. General physical exam:

It is recommended that a comprehensive physical checkup be conducted on every stallion. The recording of the general body condition score of stallions is equally crucial as it is for mares. The recommended body score for stallions typically falls within the range of 5 to 6, however this may vary depending on the specific breed, such as quarter horses or draft horses [8]. Fertility requires the successful engagement of the stallion in copulation with estrus mare [4]. This involves mounting the mare, inserting his penis into her vagina, executing suitable thrusting movements, and ultimately achieving total ejaculation [5]. It is important to identify musculoskeletal abnormalities, such as concerns with the back, hock, or lameness, as well as neurologic disorders that may hinder the capacity to engage in mating [6]. Along with mating ability of the stallion, other medical conditions are also assessed such as any congenital or heritable disorder, serum evaluation of equine arteritis virus, coggins test, and cultures for contagious equine metritis [7].

### 4. External and internal reproductive examination:

External reproductive examination mainly constitutes the evaluation of the reproductive organs of stallion that are visible externally [2]. In external reproductive examination through evaluation of penis and sheath is performed. Sheath is examined for the presence of beans on the urethral orifice or any other foreign substance that can cause infection. All parts of the penis including radix, corpus, and glans are evaluated. Activity of the corpus cavernosum and spongiosum is also recorded in order to evaluate the erection and ejaculation of a stallion [4].

Scrotal examination includes the scrotal skin (thin, pendulous, pliable and having distinct neck), thermoregulatory function is also assessed for the optimal spermatogenesis (35 °C) by measuring the scrotal surface temperature using thermography [9]. Testes should be freely mobile and symmetrical in their respective scrotal pouch (if not it may be a possible indication of cryptorchidism). Testicular size is measured on the basis of daily sperm output. Testicular dimensions range from 8.5 to 11 cm in length, 4.5 to 6 cm in width and 5 to 6.5 cm in height [7]. Testicular size can be measured with a help of calipers or ultrasound machine [Figure 1]. The formula used to quantify testicular volume is as follows: Testicular Volume =  $\frac{4}{3}(\pi abc)$ , where a represents half of the height, b represents half of the breadth, c represents half of the length, and the unit of measurement is in centimeters (cm) [1]. It is imperative for the spermatic cords to have consistent dimensions in terms of both size and diameter, falling within the range of 2.5cm to 3cm. The presence of intense discomfort in this particular region may indicate the occurrence of torsion in the spermatic cord or could be attributed to inguinal herniation [7]. The assessment of internal reproductive organs can be conducted by the methods of palpation or ultrasound [1].

The assessment of accessory glands, namely the ampulla, vesicular glands, prostate glands, and bulbourethral glands, is a crucial component of the internal reproductive examination. The prevailing abnormalities observed in the internal genital glands are seminal vesiculitis and the buildup of sperm in the ampullae. Additionally, the presence of cysts in the epididymis might adversely affect the fertility of stallions [10]. The internal reproductive examination is preferably performed after the semen collection. It is recommended to conduct a urethral culture subsequent to sexual stimulation in order to ensure the presence of pre-ejaculatory seminal fluid at the distal urethra. Following the process of semen collection, a further swab is typically taken from the urethra, and it is common practice to culture the collected semen. The post-ejaculate urethral swab is seen as comparable to a semen culture. The presence of a positive post-ejaculate urethral culture indicates the likelihood of an infection affecting the urethra, accessory sex glands, or epididymis [2].



Figure 1. Measurement of testicular width in a stallion with the help of calipers.

**5. Observation of libido and mating behaviour:**

The sexual drive of stallion, when stimulated by a female horse in estrus, and its capacity to achieve and sustain an erect state, are recorded [2]. Following this, the capacity to mount a mare or utilize a breeding apparatus, insert the penis into the mare or an artificial vagina, engage in thrusting movements, and successfully achieve ejaculation are all thoroughly observed [Figure 2]. The concept of libido can typically be classified into good or bad categories. Furthermore, it is possible to categorize it within a numerical scale ranging from 0-4, contingent upon several parameters such as the stallion's age, overall health, exercise level, and environmental conditions [11]. A score of zero indicates a significantly diminished level of libido, while a score of four indicates the highest level of libido. [Table 1]. An ideal stallion with desirable mating behavior should have a good libido, demonstrate efficient mounting ability within a timeframe of 10 seconds, achieve ejaculation upon the initial mount, and complete the full breeding process within a duration of approximately 5 minutes [Figure 3].

**Table 1. Categorization of libido of stallions.**

Score	Libido	Interpretations
0	Absent or extremely low	The stallion has minimal desire for mating and displays indications of disinterest or potential impotence.
1	Very low	Stallion may exhibit intermittent indications of interest in engaging in mating, although demonstrates a lack of zeal or regularity in its sexual actions.
2	Moderate	The stallion exhibits a moderate degree of interest in mating and engages in sexual behaviors, but without excessive intensity or frequency.
3	High	Stallion continuously exhibits a high level of interest in reproductive activities, frequently taking the initiative to engage in sexual behaviors and demonstrating notable enthusiasm.
4	Maximum	The stallion exhibits a notable desire for mating, characterized by a strong and unwavering nature, accompanied by intense enthusiasm and frequent engagement in sexual behaviors.

**6. Semen collection and evaluation:**

The evaluation of semen encompasses several parameters such as volume, color, sperm concentration, and motility.

**Volume:** Pre-collection teasing has been observed to potentially enhance the overall volume of ejaculate, however, it has no discernible impact on sperm count. The overall volume of ejaculate is reduced during the winter season compared to the summer season. The estimation of sperm concentration requires consideration of the gel-free volume, which ideally falls within the range of around 15-150ml in concentration which is highly variable depending upon the age, season and activity status of the stallion [12,13].

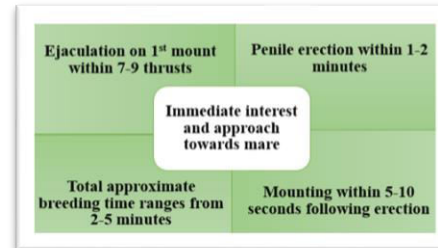
**Color and PH:** Any unusual color in the semen can indicate the presence of injury or disease to the stallion. Presence of debris also affects the evaluation of the sperm concentration [2]. The PH of the raw semen typically ranges from 7.2 to 7.9 [7].

**Sperm concentration:** The determination of sperm concentration can be achieved through two methods: the Hemacytometer and the Densimeter. The Hemacytometer is a direct and cost-effective technique that, despite being time-consuming, does not encounter issues related to discoloration. On the other hand, the Densimeter is capable of accurately measuring concentrations within the range of greater than 100 or less than 300 million sperm. However, this method is susceptible to challenges posed by discoloration or debris. The normal range for stallions is 4-12 billion sperm per ejaculate [7].

**Sperm motility:** The evaluation of sperm motility is conducted using a percentile scale, which takes into account both the percentage of motile sperm and their velocity, ranging from 0 to 4 [Table 2]. This scale classifies sperm movement from no movement to rapid movement. The ideal level of motility necessary for a high-quality semen sample is a minimum of 10% motile sperm out of the total concentration. This applies to both raw semen preserved for up to 6 hours and prolonged semen stored for up to 24 hours. In addition, the evaluation of motility involves the preparation of a slide through semen dilution, followed by microscopic examination [7].



**Figure 2. Mounting of a stallion on mare in natural breeding.**



**Figure 3. Ideal mating behaviour characteristics of stallion.**

Score	Sperm movement	Interpretations
0	No movement	Spermatozoa exhibit a lack of movement, rendering them entirely stationary.
1	Very slow movement	Sperms demonstrate limited or irregular motility, which falls significantly below the accepted standard.
2	Slow movement	Spermatozoa exhibit movement, but their motility is significantly diminished and characterized by suboptimal efficiency.
3	Moderate movement	Sperms demonstrate a moderate level of motility characterized by motions that are neither sluggish nor rapid, aligning with the typical range.
4	Rapid movement	Sperms exhibit vigorous and fast motility, which suggests a heightened degree of sperm functionality and viability.

**Table 2. Motility velocity of stallion sperms**

**7. Conclusion:**

An optimal Breeding Soundness Examination (BSE) encompasses a comprehensive evaluation of the stallion's reproductive history, thorough physical tests, thorough behavioral assessments, and diligent semen evaluation. The implementation of this holistic method has the potential to promote stallion fertility, hence resulting in improved progeny quality. This, in turn, contributes to the sustained success of equine breeding operations.

**References**

- [1] Varner DD. Approaches to breeding soundness examination and interpretation of results. Journal of Equine Veterinary Science. 2016 Aug 1;43:S37-44.
- [2] McCue PM. Breeding Soundness Evaluation of the Stallion. Equine Reproductive Procedures. 2014 Jul 28;319-24.
- [3] Love CC. The role of breeding record evaluation in the evaluation of the stallion for breeding soundness. InProc Soc Therio 2003 (pp. 68-77).
- [4] Crabtree J. Prebreeding examination of the stallion: 1. Physical examination. In Practice. 2010 Jan;32(1):22-8.
- [5] Chenier TS. Anatomy and physical examination of the stallion. Equine breeding management and artificial insemination. 2009 Jan 1:2.
- [6] COOPERATIVEEXTENSIONS E. The Stallion: Breeding Soundness Examination & Reproductive Anatomy.
- [7] Brinsko SP, Blanchard TL, Varner DD, Schumacher J, Love CC. Manual of equine reproduction. Elsevier Health Sciences; 2010 May 19.
- [8] Usman CA, Akram Q, Ali F, Hayder H, Idrees H. The Importance of Breeding Soundness Examination in Mares and Optimal Reproductive Success Procedures. 2(8): 3-4
- [9] Neto CR, Monteiro GA, Delfiol DJ, Farras MC, Dell'aqua Jr JA, Papa FO, Alvarenga MA. The relationships between scrotal surface temperature, age and sperm quality in stallions. Livestock Science. 2013 Oct 1;157(1):358-63.
- [10] Pozor M. Diagnostic applications of ultrasonography to stallion's reproductive tract. Theriogenology. 2005 Aug 1;64(3):505-9.
- [11] Dinger JE, Noiles EE. Effect of controlled exercise on libido in 2-yr-old stallions. Journal of Animal Science. 1986 May 1;62(5):1220-3.
- [12] Sieme H. Semen evaluation. Equine breeding management and artificial insemination. 2009 Jan 1:57-74.
- [13] Wilson M, Williams J, Montrose VT, Williams J. Variance in stallion semen quality among equestrian sporting disciplines and competition levels. Animals. 2019 Jul 25;9(8):485.