Providing Veterinary Service in Thoroughbred Breeding Sheds

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A variety of veterinary breeding shed services can be provided to Thoroughbred farms that may improve efficiency of operation and optimize fertility of stallions. Some methods for providing and charging for these services are discussed. Authors’ addresses: Department of Large Animal Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Texas A&M University, College Station, Texas 77843-4475 (Blanchard, Brinsko, Varner, Love); and Highcroft Farm, 2601 Old Frankfort Pike, Lexington, Kentucky 40510 (Umphenour); e-mail: tblanchard@cvm.tamu.edu. © 2010 AAEP.

1. Introduction

It has become commonplace at many Thoroughbred breeding farms to have a veterinarian attend breeding sessions to provide veterinary services, oversight, or recommendations. In concert with the farm and stallion managers and the farm veterinarian, duties of the veterinarian in the breeding shed are tailored to individual farm management needs. Such duties may include: ensuring documentation of prebreeding requirements are in order; monitoring preparation and readiness of mares presented for mating, including the need for additional restraint and/or sedation or need for the use of a breeding roll; observation of matings and confirmation of their successful completion (which may include videotaping); evaluation of videotapes of breeding sessions used to document successful covers and the cause for any injury that may have occurred during a mating session; evaluation of dismount samples for presence of sperm and overall quality; monitoring for potential changes in stallion semen quality; suggestion of reinforcement breeding of mares immediately post-mating with dismount semen samples; examination of mares post-breeding if a breeding injury is suspected; procurement of stallion genital screening cultures at periodic intervals to monitor for potential bacterial venereal infections and prescribing of any indicated treatments thereof; periodic evaluation of pregnancy rates in mated mares to assess ongoing fertility of stallions during the course of the breeding season; and provision of year-end fertility assessments.1,2 This paper is not meant to be a complete description of shed services that can be provided by veterinarians but will provide information on performing some of these services, with some illustrations of their value and limitations. Although the emphasis of the paper is on larger Thoroughbred breeding farms, a number of the procedures might be found useful for smaller breeding farms using less expensive stal-
2. Preparing the Mare for Breeding

Mares presented for breeding are first identified and tagged and then placed in a stall next to a teaser stallion (usually confined in a teasing box stall). A window is opened that allows the mare exposure to the teaser stallion, thus encouraging the mare to exhibit behavioral signs of estrus to ensure readiness for breeding. It is important for a mare to have this time in a straw-bedded stall to relax and urinate before moving her to the preparation area and breeding shed. If this step is eliminated, the mare may be moved to the breeding shed so quickly that she is still nervous, with a full urinary bladder, resulting in a greater likelihood for repeated mounts being required to accomplish the mating or urination during mating that may interfere with the quality of cover. When the mare leaves the teasing box stall, she is moved to a preparation area where the tail is wrapped (with single-use gauze material) and the perineum cleansed. If necessary, vulvar sutures are removed to permit safe penile intromission. The mare is taken to the breeding shed where padded leather boots are placed on the hind feet before being moved to the location for mating. The teaser stallion, with a breeding shield to prevent intromission, is brought to the shed and allowed to mount the mare to determine if the mare will stand safely for mating. If the mare allows mounting by the teaser stallion, mating to the stallion to which the mare is booked is then permitted. If doubt exists that the mare will stand safely for mating, a tranquilizing agent(s) is/are administered intravenously to the mare. After allowing the tranquilizing agent(s) to take effect, mounting with the teaser stallion is again attempted. If the tranquilized mare allows mounting by the teaser stallion, mating to the stallion to which the mare is booked is then permitted. Although few studies on effects of tranquilization on fertility of mares have been performed, recent information showed that maiden Thoroughbred mares tranquilized (e.g., 100 mg xylazine, 20 mg acepromazine, and 10 mg butorphanol tartrate) immediately before mating can have acceptable fertility. Older mares more experienced with mating (e.g., foaling mares, barren mares, etc.) will likely have reduced pregnancy rates when tranquilization is required, perhaps because they are not in an optimal stage of estrus (Fig. 1). Whether the reduced pregnancy rates achieved when breeding tranquilized older mares are related to delayed uterine clearance has not been determined. Nevertheless, the shed veterinarian may be justified in refusing to allow mating of certain mares (e.g., barren) that will not stand safely for mating without tranquilization.

3. Monitoring of Dismount Semen Samples

Monitoring of dismount semen samples (collected as drippings from the stallion’s urethra) for the presence of sperm is a technique used to confirm that ejaculation occurred during a given cover (mating). Although it is rare for a stallion to exhibit behavioral signs of ejaculation, yet fail to ejaculate, microscopic examination of the dismount semen sample will reveal few or no sperm present if ejaculation did not occur. Rarely, stallions may develop retrograde ejaculation (i.e., ejaculate into the urinary bladder) or develop obstruction to sperm outflow (e.g., plugged ampullae), which results in few or no sperm being present in ejaculates. In most instances, stallions that did not ejaculate will promptly achieve another erection and cover the mare again within a few minutes. Repeating the mating sequence in these situations will, thus, ensure that the mare has an opportunity to become pregnant. Evaluating the dismount sample for sperm concentration is also useful for identifying incomplete ejaculations (very few sperm) that some stallions occasionally experience. Usually, the stallion that occasionally experiences incomplete ejaculation will promptly achieve another erection and cover the mare again. Routine examination of dismount samples is also useful as a technique for monitoring semen quality.
over the course of the season. Prompt mixing of the

dismount sample with a suitable prewarmed semen
extender, followed by filtering and observation of
sperm motility using a phase-contrast microscope with
warming stage, has been recommended.2 Adding a
few drops of the dismount sample to 2% buffered for-
mal saline will permit later examination of the sperm
for incidence of morphologic defects. Sperm motility
and morphology in dismount samples have been posi-
tively correlated with fertility.6,7 If sperm concentra-
tion, motility, and morphology in dismount semen
samples consistently decline with progressive sperm
motility of 60–79% were increased (p < 0.05). Modified
from Blanchard TL et al.3

Monitoring dismount samples for presence of in-
flammatory cells is also useful, because the presence
of significant numbers of neutrophils can coincide
with reduced fertility of that mating (Fig. 3). The
sporadic presence of a high number of neutrophils in
a dismount semen sample suggests that the mare is
the source of inflammation. Mares that have an
underlying genital infection, not detected by routine
prebreeding examination, are sometimes identified
in this manner. The finding of significant numbers
of neutrophils in dismount samples can, therefore,
be used to alert a farm veterinarian to direct post-
breeding treatment(s) to the affected mare. If
there is a consistent increase in inflammatory cell
numbers in virtually all dismount samples from a
stallion mating mares of good reproductive quality,
the potential for the stallion having an internal gen-
ital infection should be explored. If semen collected
in an artificial vagina likewise has increased num-
bers of inflammatory cells, further diagnostic proce-
dures should be performed to determine location and
extent of the infection and arrive at appropriate
treatment modalities.8

4. Reinforcement Breeding

Reinforcement breeding (often termed impregna-
tion) is a process whereby the dismount semen sam-
ple (and/or semen pooled in the vagina) is collected
immediately after natural cover and is then infused
into the uterus of the mare that was just mated.
Because dismount samples can contain large

Fig. 2. Relationship between progressive sperm motility in dis-
mount samples to pregnancy rates achieved by 15 Thoroughbred
stallions at one farm in central Kentucky during 2005–2007. Al-
though a linear relationship between dismount-sample progressive sperm motility and pregnancy rates/cycle seems to be
present, pregnancy rates achieved when dismount samples had a
low percentage of progressively motile sperm were still acceptable
for stallions on this farm. Compared with the overall study
fertility, pregnancy outcome for dismounts with progressive sperm motility of 60–79% were increased (p < 0.05). Modified
from Blanchard TL et al.3

Fig. 3. Relationship between frequency of neutrophils (PMNs) in
dismount samples and pregnancy rates achieved by 15 Thorough-
bred stallions on one farm in central Kentucky during 2005–
2007. Pregnancy rates were lower (p < 0.05) in mares from which
any neutrophils were noted in dismount samples obtained immedi-
ately after the mares were mated. None, 0 PMN observed per
250× field; slight, 1–10 PMN observed per 250× field; moderate,
11–50 PMN observed per 250× field; frequent, >50 PMN observed
per 250× field. Modified from Blanchard TL et al.3
amounts of debris, it is wise to first filter the dismount sample and then to immediately mix the dismount semen sample with a suitable volume (e.g., 5–20 ml) of prewarmed extender before infusion into the uterus of the mare. Alternatively, prewarmed semen extender can be mixed with the dismount sample (or semen sample aspirated from the vagina) before filtering. Although not all stallions will benefit from reinforcement breeding, stallions that have a tendency to dismount early after ejaculation (with the penis still erect and sometimes with the glans penis still engorged) or that have difficulty in remaining fully intromitted into the mare’s vagina during mating are candidates that should benefit from the procedure, because they are less likely to deposit major portions of the ejaculate into the mare’s uterus during mating. Other disorders that may benefit from reinforcement breeding include failure to ejaculate sufficient numbers of normal motile sperm (particularly if sperm motility rapidly declines in vitro) and shedding of potential bacterial pathogens in semen, urospermia, or hemospermia. When significant amounts of urine (regardless of whether the stallion or mare is the source of urine) are present in dismounts, addition of extender may not restore motility, and reinforcement breeding with that sample is contraindicated. One management protocol employed by some farms is to reinforce all mares that fail to become pregnant on the first estrous cycle when they return on later cycles for mating. After a sufficient number of mares have been reinforcement bred, pregnancy rates can be compared between reinforced and non-reinforced mares (Table 1). If fertility seems to be improved, reinforcement breeding may be justified as a standard protocol for that stallion. In a recent study of factors affecting fertility of Thoroughbred stallions during one season, reinforcement bred stallings significantly improved pregnancy rates in 8 of 13 stallions.9

<table>
<thead>
<tr>
<th>Stallion</th>
<th>Without Reinforcement</th>
<th>With Reinforcement</th>
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<tbody>
<tr>
<td>1</td>
<td>5/10 (50%)</td>
<td>8/41 (68%)</td>
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<tr>
<td>2</td>
<td>7/13 (54%)</td>
<td>40/55 (73%)</td>
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<td>3</td>
<td>1/3 (33%)</td>
<td>11/19 (58%)</td>
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<td>4</td>
<td>4/8 (50%)</td>
<td>20/27 (74%)</td>
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<td>1/2 (50%)</td>
<td>1/3 (33%)</td>
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<td>6</td>
<td>3/8 (50%)</td>
<td>24/41 (59%)</td>
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<tr>
<td>7</td>
<td>6/9 (67%)</td>
<td>42/59 (71%)</td>
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<tr>
<td>8</td>
<td>1/4 (25%)</td>
<td>31/47 (70%)</td>
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<tr>
<td>9</td>
<td>3/12 (25%)</td>
<td>29/46 (63%)</td>
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<tr>
<td>10</td>
<td>4/9 (44%)</td>
<td>28/45 (62%)</td>
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<tr>
<td>11</td>
<td>1/2 (50%)</td>
<td>20/26 (77%)</td>
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<tr>
<td>12</td>
<td>6/9 (67%)</td>
<td>27/42 (64%)</td>
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<tr>
<td>13</td>
<td>0/3 (0%)</td>
<td>4/7 (57%)</td>
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<tr>
<td>Total</td>
<td>42/89 (47%)</td>
<td>305/458 (67%)</td>
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Pregnancy rate per second cycle seemed to be improved in all but two stallions, although sufficient numbers of second-cycle matings are lacking for some stallions. Table from Blanchard.2

5. Screening Cultures of Stallions
Performing regularly scheduled cultures of the distal urethra, fossa glandis, shaft of the penis, and prepuce of stallions can be used to monitor for potential bacterial venereal infections in natural-service programs. Because potential bacterial venereal pathogens are usually only harbored on the external genitalia, cultures should be collected before washing and before covering the first mare of the day. Some Thoroughbred farms perform these screening cultures weekly, bi-weekly, or monthly. The shed veterinarian is cautioned against diagnosing the stallion as a carrier of a venereal pathogen simply because Pseudomonas aeruginosa or Klebsiella pneumoniae are recovered on culture, because these organisms are common environmental contaminants of soil, stall bedding, and breeding-shed floors. There are many phage types of Pseudomonas and many capsule types of Klebsiella that are considered to be nonpathogenic, and therefore, the diagnosis of the stallion as being a carrier of a venereal pathogen should not be made solely on recovery of one of these organisms on culture without other confirmatory evidence of venereal transmission.10

Unfortunately, diagnostic laboratories in the United States do not routinely provide phage- or capsule-typing services. Certainly, any stallions from which these organisms are recovered should be recultured to determine whether true colonization of the external genitalia has occurred (i.e., often, this second set of swabs will fail to yield the organism, suggesting transient contamination from a previous mating may have occurred). In the United States, notification of breeders, culturing of exposed mares, and/or treatment of potential carrier stallions for P. aeruginosa or K. pneumoniae are voluntary procedures. Methods for treat-
ment and/or prevention of spread to mares that can be used if deemed necessary include: (1) thorough washing of the stallion’s penis, rinsing with either dilute HCl acid (10 ml concentrated [38%] HCl per gallon of distilled water for *Pseudomonas* colonization) or dilute bleach (30 ml Chloroxa per gallon of distilled water for *Klebsiella* colonization), and liberally applying Silvadeneb cream to the penis and prepuce daily for 5–7 days, (2) pre-breeding uterine infusion of 20–40 ml semen extender containing an appropriate antibiotic (e.g., Timentinc 1 mg/ml), or (3) post-breeding reinforcement breeding of the dismount sample mixed with an extender that contains an appropriate antibiotic. Use of a Woods lamp for illumination of potentially colonized areas with *Pseudomonas* has been recommended to help identify areas for disinfection. It should be remembered that water sources can serve as a focus for *Pseudomonas* contamination, and therefore, investigative measures should include evaluation of moist areas (sinks, taps, etc.) for the organism. The reader is referred elsewhere for discussion of diagnosis and treatment of venereal diseases in the stallion, including Contagious Equine Metritis and Equine Viral Arteritis.11,12

6. Monitoring Fertility With Records
It is advantageous for the shed veterinarian to maintain accurate up-to-date breeding records so that fertility data can be used to help detect potential problems quickly. A variety of record systems (manual or computer-based) can be used for this purpose as long as they permit easy and thorough evaluation of stallion performance at any given point during the breeding season. The Jockey Club has a computerized record system (Horse Farm Management) that summarizes many pertinent fertility endpoints that can be calculated at intervals during and after the season. Examples of a manual record system using two records are provided in Figures 4 and 5. Using the form in Figure 4 allows entry of pertinent data from each cover of a stallion in chronological order, and using the form in Figure 5 permits presentation of pregnancy outcome in the form of a graph that then allows examination of the relationships of mating frequency, beginning status of mares covered, their cycle of the year, and the cover of the day for the stallion on pregnancy rates. Evaluating reproductive performance at regular intervals throughout the season (e.g., monthly) should be done to provide confidence that a given stallion’s fertility is good or alternatively, to provide evidence for alerting management and the farm veterinarian to potential problems that may require prompt intervention to restore reproductive performance to an acceptable level. For example, if pregnancy rate precipitously declines on later covers in a day, management may choose to limit the number of covers per day allowed for a given stallion to a level that does not compromise fertility. Another example wherein such a record system is useful is when declining pregnancy rate is shown to be related to the quality of mare covered (e.g., lowered pregnancy rates only in barren mares). If either first-cycle pregnancy rate or pregnancy rates in maiden and foaling mares (typically the most fertile mares) remains good, concern over the stallion’s fertility and/or mating management is probably not warranted.

7. Charging for Service
Charges for shed services are commonly borne by the stud farm and not individual mare owners.

<table>
<thead>
<tr>
<th>Date</th>
<th>Mare name</th>
<th>Farm name</th>
<th>Status</th>
<th>Cycle</th>
<th>Cover</th>
<th>Mounts</th>
<th>Double</th>
<th>Dismount</th>
<th>Reinforce</th>
<th>TQ</th>
<th>Other</th>
<th>Outcome</th>
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Fig. 4. A manual recording system to be filled out chronologically with pertinent data for a given stallion after each cover is completed, including: date of cover, mare identification, boarding farm for the mare, beginning status of the mare (F, foaling; M, maiden; B, barren; NB, not bred; S, slipped), cycle of breeding (1st, 2nd, 3rd, etc.), cover of the day for the stallion (1st, 2nd, 3rd, etc.), number of mounts required to complete service, whether the cover is a double during the same cycle or not, quality of the dismount sample (may include a scoring system for sperm motility and concentration), whether reinforcement breeding was used on that cover or not, whether or not the mare had to be tranquilized to facilitate a safe cover, other comments thought to be useful (e.g., was the mare difficult to cover and why, did the mare tolerate a twitch, were inflammatory cells noted in the dismount, etc.), and the outcome of the cover (pregnant or not pregnant). From Umphenour N et al.1
If syndicated stallions are involved, the syndicates usually bear the cost for the services (split among syndicate members). There are several methods for charging for veterinary breeding-shed services that can be considered. They include but are not limited to: (1) fee for service (itemized charges for procedures performed while in the shed), (2) hourly fees for professional time spent in the shed (with the farm providing supplies required to perform services and paying for laboratory fees), or (3) standardized fees for shed services performed on a per stallion or per season basis (which might include a preseason breeding-soundness examination plus provision of certain procedures performed on a routine basis, such as screening cultures and periodic reports on monitoring protocols). Fees can be negotiable based on supplies and laboratory expenses anticipated as necessary to perform services. Alternatively, some large veterinary practices performing the routine breeding work on a farm may offer to provide interns for breeding-shed services as a part of negotiated services to the farm. Being flexible to meet each individual breeding farm’s needs, which can vary greatly according to experience level of breeding-shed personnel employed by the farm, will no doubt facilitate promotion of veterinary involvement in breeding shed services.

8. Summary
Provision of veterinary breeding-shed services at Thoroughbred farms is becoming more commonplace. This article outlines how to provide a number of these breeding shed services along with some illustrations of potential benefits. Methods for charging for these services are varied and can be adapted to farm management needs.

References and Footnotes

*Clorox Regular-Bleach, The Clorox Company, Oakland, CA 94612.
*Silvadene Cream 1%, Monarch Pharmaceuticals, Inc., Bristol, TN 37620.
*Timentin, GlaxoSmithKline, Research Triangle Park, NC 27709.