

How We Select, Prepare, and Maintain a Stimulus/Mount Mare

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A stimulus/mount mare that is an easy keeper, sound, and reliably attractive and receptive to most stallions, as well as comfortable with her work and easy to handle, is invaluable to a breeding facility. Organized and systematic behavior evaluation specific to your clinic's protocols before selection will reveal undesirable behaviors that may prove unsafe in the semen collection environment or may complicate or prevent successful semen collection. In the case of intact mares, bilateral ovariectomy performed through colpotomy or a hand-assisted laparoscopic approach with colpotomy allows for a short convalescent period compared with other approaches. Additionally, flank sensitivity can be avoided by colpotomy. In the absence of functional ovaries, frequent, low-dose estrogen supplementation can usually maintain estrus adequate for a stimulus/mount mare. Authors' address: School of Veterinary Medicine, University of Pennsylvania, New Bolton Center, 382 West Street Road, Kennett Square, PA 19348; e-mail: kmwhite@vet.upenn.edu. *Corresponding and presenting author. © 2013 AAEP.

1. Introduction

Although some stallions, initially or after training, respond adequately for semen collection in the absence of a live mare, most semen collection facilities do require a live mare to accommodate stallions that do not respond. A cycling mare in natural estrus close to ovulation is typically the most stimulating to stallions. However, to ensure availability of a suitable mare in estrus on any given day throughout the year, a fairly substantial herd of monitored/cycle manipulated mares from which to choose is typically required. It has long been known that in the absence of ovarian steroid hormones, whether during anestrus, in certain karyotypic abnormal states (XO), in senescence, or after ovariectomy, mares can show estrus sufficient to stimulate response of most stallions for semen collection as well as tolerate mounting for semen collection or schooling for nat-

ural cover. Accordingly, a commonly used alternative to a cycling mare in estrus is a mare without functional ovaries that is administered exogenous estrogen as needed to maintain estrus at a level sufficient for the needs of the facility.

In a quantitative study of the behavior of 10 ovariectomized and 10 seasonally anestrus mares, Asa et al¹ reported that 17 of the 20 mares showed some degree of receptivity (tolerance of the stallion's approach, teasing, mounting, insertion) on most test days. The probability of any particular mare exhibiting estrus on any test day in their study was reported to be 50%. The intensity of estrus observed was comparable to that of mares transitioning between estrus and diestrus phases, which is less intense than is typical of the day before and the day of ovulation. This study also quantitatively confirmed the long-time anecdotal observations of wide

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variation in the degree of proceptivity (solicitousness), receptivity (tolerance of mounting), and attractivity (stallion sexual response) of mares without ovarian steroid influence, both among mares and from day to day within-mare. Only one of the 20 mares was observed to exhibit estrus on all 15 observation days of the study. In a follow-up study of steroid hormone treatment of ovariectomized mares, it was demonstrated that estrogen treatment increased the intensity and decreased variation in estrus as well as correspondingly increased the intensity and decreased the variation in stallion response.² Estrogen-treated mares showed strong estrus for 80% of the tests and weak estrus for an additional 3%. Untreated mares showed strong estrus in only 23% of tests and weak estrus for an additional 33%.

This report presents our experience with selection of candidates for stimulus/mount mares as well as preparation and estrogen treatment of ovariectomized mares for comfortable, effective, and safe use in an equine reproduction and behavior teaching clinical and research facility with a variety of unknown and known stallions of various breeds. These circumstances necessitate year-round availability of reliable stimulus mares that are also compliant with mounting for semen collection, novice stallion schooling, and a variety of other reproduction teaching exercises involving rotating staff and students of various levels of handling ability and horse breeding experience.

2. Candidate Selection

Initial Considerations

When considering particular mares as candidates for preparation to be a stimulus/mount mare, we first try to identify candidates with (1) a behavioral history of excellent temperament and interaction with humans and other horses, both for general ground handling as well as when interacting with a stallion for estrus detection or breeding, and (2) generally good health, soundness, and ease of maintaining good body and particularly foot condition. We also consider the age of the mare because there is considerable effort and expense to preparation, and we prefer to expect as many years of service as possible. Although there are no data to confirm the concepts, we consider the tendency for (1) demonstrative estrus for several days each cycle and (2) less frequent and demonstrative aggressive responses to stallions during diestrus to be predictive of better performance and comfort as a stimulus/mount mare. If this history is known, we certainly take it into consideration. Also, because of our experience with apparent color, breed, and size preferences and aversions among stallions, we aim to maintain a variety of these characteristics among our available stimulus/mount mares.

Systematic Behavior Evaluation

If a mare meets those initial behavior and soundness selection criteria, we then systematically evaluate her behavioral comfort and compliance with a battery of anticipated breeding shed protocols for semen collection, breeding, and schooling of stallions specific to the environment in which she will be used. Winter anestrus presents an ideal opportunity for this evaluation because it most closely approximates the ovariectomized condition. However, for mares that are not anestrus, we of course evaluate the specific breeding shed tasks when she is in estrus.

Comfort and compliance with tasks specific to the stimulus/mount mare occupation in our teaching and clinical environment include tolerance and comfort with application of a twitch, breeding cape, hobbles, breeding boots, and tail wrap; expression of proceptive and receptive responses as well as attractivity to stallions both with and without a twitch; easy "steerability" with and without a twitch; ease and comfort with loading, standing for long periods, and unloading in stocks or adjacent the dummy mount; absence of tendency for non-receptive or discomfort responses (striking, squealing, biting, kicking, striking, "bunny hopping," rearing, slapping or swishing tail, moving away, pinning ears, tensing up, cowering) even with prolonged teasing; tolerance of mounting by a test stallion wearing an "apron" (for teaching purposes). We aim to evaluate the stallion and mare response with stallions of various ages, experience, breeds, and breeding temperaments. Because we are a teaching facility with day-to-day variation in the handling team, we also try to assess the candidate's cooperation and comfort with handlers of various skill levels and handling styles. A particular concern is to identify behavior that would pose safety threats for less experienced student handlers in a teaching environment. Fig. 1 illustrates an example check sheet that we use to record test session findings. Fig. 2 includes a series of images from a candidate evaluation session.

3. Preparation

The goal of a dedicated stimulus mare is to remove the limitations of cyclicity and seasonality encountered when selecting mares to aid in semen collection. This can be achieved through ovariectomy and subsequent estrogen replacement or estrogen replacement alone for mares with non-functional ovaries.

Ovariectomy

Various approaches for ovariectomy in the mare include colpotomy, flank laparotomy, paramedian celiotomy (oblique or caudal), ventral midline celiotomy, and various laparoscopic techniques, either conventional or hand-assisted as summarized by Loesch and Rodgerson.³ A complete discussion of surgical technique is beyond the scope of this report;

Stimulus/mount Mare Candidate - Systematic Behavior Evaluation

Mare: _____ Age: _____ Breed: _____ Color: _____
 _____ Intact Natural Estrus
 _____ Intact Anestrus _____ Intact Anestrus plus E-17B (recent regimen _____)
 _____ OX no estrogen _____ OX plus E-17B (recent regimen _____)

Evaluator/s: _____ Video: _____ Date: _____ Mare handler/s: _____

Rate each from 1 (poorest) to 10 (excellent) & comment on deficiencies or particularly good attributes:

Breeding cape on/off	1 2 3 4 5 6 7 8 9 10	_____
Tail wrap/wash	1 2 3 4 5 6 7 8 9 10	_____
Stocks: Load willingly	1 2 3 4 5 6 7 8 9 10	_____
Wait unattended	1 2 3 4 5 6 7 8 9 10	_____
Back out well	1 2 3 4 5 6 7 8 9 10	_____
Sub Q injection	1 2 3 4 5 6 7 8 9 10	_____
Twitch application	1 2 3 4 5 6 7 8 9 10	_____
Direct with twitch on (incl. parade)	1 2 3 4 5 6 7 8 9 10	_____

Quality of estrus with twitch:	Quality of estrus without twitch:
_____ Tail up	_____ Tail up
_____ Wink	_____ Wink
_____ Head, ears mating posture	_____ Head, ears mating posture
_____ Tolerate nipping	_____ Tolerate nipping
_____ Urinate	_____ Urinate
_____ Head back	_____ Head back
_____ Flex foreleg	_____ Flex foreleg

Response with variety of stallions:

Stallion 1 _____	Teasing	1 2 3 4 5 6 7 8 9 10	_____
	Test Mount	1 2 3 4 5 6 7 8 9 10	_____
	AV Mount	1 2 3 4 5 6 7 8 9 10	_____
	Alongside dummy	1 2 3 4 5 6 7 8 9 10	_____
Stallion 2 _____	Teasing	1 2 3 4 5 6 7 8 9 10	_____
	Test Mount	1 2 3 4 5 6 7 8 9 10	_____
	AV Mount	1 2 3 4 5 6 7 8 9 10	_____
	Alongside dummy	1 2 3 4 5 6 7 8 9 10	_____
Stallion 3 _____	Teasing	1 2 3 4 5 6 7 8 9 10	_____
	Test Mount	1 2 3 4 5 6 7 8 9 10	_____
	AV Mount	1 2 3 4 5 6 7 8 9 10	_____
	Alongside dummy	1 2 3 4 5 6 7 8 9 10	_____

Specific problems (mark any that apply): squeal, ears back, kick, bunny hop, bite strike, head high, lean too much into stallion, sway/move uncontrollably when mounted, push back into stallion uncontrollably, push uncontrollably against dummy, other:

Fig. 1. Example check sheet for systematic behavior evaluation of stimulus/mount mare candidates.

however, consideration of the implications of the various approaches for intended use as a stimulus/mount mare is warranted. Flank incisions not only require an extended convalescent period (4 to 6 weeks), but, in our experience, flank incisions often result in an aversion to flank contact that not only complicates mounting by a stallion for semen collection through the use of the artificial vagina or as an intermediate training step but also seems to predispose some mares to be less tolerant of vigorous pre-copulatory interaction. In contrast, for colpotomy, the convalescent period is only 2 weeks (or in our experience less if necessary), and there is no external scarring.⁴ Although a conventional lapar-

oscopic approach carries the advantage of improved visualization of the ovary and mesovarium over the flank approach, extension of portal incisions to facilitate extraction of the ovary is still necessary. Therefore, postoperative healing time, incisional complications, and persistent flank sensitivity are concerns for a stimulus/mount mare. Recently, hand-assisted techniques have been developed to combine the laparoscopic visualization with ovary extraction by means of colpotomy to minimize flank incisional length and consequently, convalescent time. For such techniques, a chain ecraseur or vessel sealing/tissue dividing instrument^a has been used for transection and hemostasis of the mesovar-



Fig. 2. Systematic evaluation of a stimulus/mount mare candidate: The mare demonstrated difficulty accepting twitch application, repeatedly escaping the twitch even with two skilled handlers (A); initially appeared fearful of the breeding cape but later acclimated (B); loaded easily into stocks (C); tolerated subcutaneous injection (D), tail wrap (E), and perineal washing (F); appeared comfortable standing unattended in stocks for approximately 5 minutes (G), after which she became fidgety and appeared anxious; showed estrus to a stallion initially (H); however, when the stallion was allowed more vigorous close contact, she became less tolerant (I), after which she appeared to panic and attempted to escape.

ium.^{4–6} The use of this combined approach removes inherent risk of a traditionally blind colpotomy approach while minimizing concerns associated with flank incisions. However, other potential complications from colpotomy, including peritonitis, eventration, intra-abdominal adhesions to the vagina, and damage to the cervix, bladder, or bowel, are not circumvented.

Estrogen Treatment

Anecdotally, there seems to be wide variation in estrogen treatment protocols used to maintain adequate estrus in stimulus/mount mares. Ginther⁷ discussed heightened sensitivity of anestrus mares to low doses of estrogens, citing early work done by Nishikawa demonstrating a minimum effective dose of estrone for induction of estrus to be 50 mg. Estrus was seen as early as 4 hours and no later than 10 hours after administration, and the duration of estrus ranged from 3 to 10 days. Ginther also discussed estrogen supplementation in ovariectomized mares, citing work done by Hillman administering 0.5 mg or 5 mg of estradiol to mares that resulted in interest to a stallion within 3 hours and maximal estrus response in 9 hours. Mares subsequently returned to pretreatment behavior in 48 hours for the 0.5-mg dose and 96 hours for the 5-mg dose. Daily estradiol treatment at 1 mg/day resulted in positive estrus signs for the duration of administration. Of the two forms of estrogen with which we have extensive experience with ovariectomized mares (estradiol cypionate and estradiol 17- β), we have found estradiol 17-beta in oil^b to typically result in more reliable, consistent, and full complement of estrus responses that more reliably elicits positive stallion response. On the basis of early success in maintaining good response for mares used in our research program, the estrogen treatment regimen that our clinical facility has adopted for use with average size light horse stimulus/mount mares, whether ovariectomized or with dysfunctional ovaries, is 0.5 mg estradiol 17- β administered subcutaneously every other day for the first three doses followed by 0.25 mg administered subcutaneously every other day for maintenance. It is our experience that the majority of mares (estimated three of four) maintain a strong estrus response at this level fairly long term (several weeks to many months, in some cases). Certain larger mares may do better with slightly higher doses. We have found that less frequent treatment with higher dosage typically results in less consistent estrus and may result in stallion-like behavior. We have also found that in the case of a mare that initially performs well with the low, frequent dose

schedule but then becomes increasingly difficult to work with or off-putting to the stallion, a return to a better response can typically be achieved by discontinuing treatment for a brief period. As little as a few days to 1 week off before return to estrogen treatment has been effective. After the break, we resume treatment with the initial three 0.50-mg doses. Some mares as individuals may benefit from time off treatment (and work). We have also found that for rare instances, when it is judged that additional estrogen may be helpful on short notice, estrogen can be applied intravaginally, with what appears to be positive effects within 2 to 4 hours. Hyperemia of the vaginal mucosa generally follows intravaginal topical application, which typically resolves within a few days at most. Nonetheless, because of this untoward side effect that could be counterproductive to receptivity, we reserve the vaginal topical route of administration for rare situations requiring a rapid improvement in response.

Experience/Training

Despite careful selection and preparation of candidates, not all meet the challenges of our facility. In our experience, stimulus/mount mares can either become more or less tolerant and comfortable with time of service. Some appear to improve with positive experience. Some can become less comfortable and willing, possibly because of frequency and intensity of use, temperament of particular stallions, and experience with handling styles.

References and Footnotes

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^aLigasure, Covidien Surgical Solutions Group, Boulder, CO 80301.

^bEstradiol 17- β , 3.33 mg/mL, Hagyard Pharmacy, Lexington, KY 40511.