



Review Article

Revisiting Clinical Stallion Sexual Behavior: Applying Ethology in the Breeding Shed

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ABSTRACT

An understanding of basic ethology and applied animal behavior science concepts can provide valuable insight into the most of the common breeding behavior problems of domestically managed stallions. Based on that insight, recommendations can be made for resolving or more efficiently managing those problems. The shy or intimidated breeder is presented as one example illustrating this approach. For many such stallions their behavior appears to reflect the key behavioral characteristics common among open-plains grazing prey species. For a subset, elements of their behavior with a mare can be recognized as the alternate male breeding strategy of sneak breeding. With this understanding, science-based management and handling changes can be made to reduce inhibition, build confidence and motivation, as well as promote specific natural male-female interactive behavior sequences that will enhance sexual arousal and response.

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Ethology is a subdiscipline of animal behavior science that focuses on the study of the behavior of animals as it evolved under natural conditions. Animal behavior science additionally includes behavior modification principles and practices, as well as behavioral endocrinology and physiology. The disciplines of applied ethology and applied animal behavior science focus on the use of this knowledge in wild and domestic animal management and welfare. Although extraordinarily relevant to breeding of domestic animals, basic or applied ethology and animal behavior science are rarely included in much practical detail in animal husbandry, animal science, and veterinary medicine curricula. As a result, long-known ethological concepts relevant to efficient and more humane animal reproduction, such as natural social organization and breeding strategies, sign stimuli, fixed-action patterns, and their importance to male-female interactive sequences, are not widely appreciated or applied in equine breeding management. To illustrate their

usefulness, this clinical commentary briefly summarizes two fundamental equine ethological concepts relevant to equine reproduction. Using the example of the “shy, slow, or inconsistent” problem breeding stallion, ethological explanations for the problem behavior are proposed and specific clinical recommendations are suggested.

1. Open-Plains Prey Grazers

Behavioral characteristics of a species are, of course, a reflection of the environment in which the species evolved. Horses evolved as an open-plains, prey grazing herd species. A principal behavioral characteristic of the behavior of such species is vigilant attention to the environment and to potential predators. As an aid in detection and escape from predators, these grazing prey species have evolved to acutely recognize and reflexively respond to the emotional states of organisms in their environment. Interspecies and intraspecies communication of fear, anxiety, or anger favors survival, whereas similar communication of relaxation and comfort serves as safety signals to modulate the stress inherent to prey species.

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For these species, any activity such as breeding or parturition, that distracts or momentarily incapacitates one or more members of the herd or draws attention to the distracted individuals, increases the risk of predation. Accordingly, precopulatory and copulatory behavior in these open-plains grazing species has evolved to be quietly inconspicuous and relatively brief.

In natural harem breeding equid social systems, stallions appear to bear the heaviest burden of vigilance and defense of the herd. In contrast to the familiar boisterous approach that is seen in domestic stallions due to the unnatural isolation or separation from mares, precopulatory interaction and copulation are relatively quiet under natural social conditions. When a harem mare is in estrus, the harem stallion closely and continuously tends that mare [1]. Tending involves grazing a stride or two behind the mare in estrus, following along reflexively “in step” with the mare. The stallion appears to be simultaneously focusing attention on the mare’s every movement, while remaining vigilant for any potential threats. The stallion investigates and fastidiously urinates over any feces or urine voided by the mare. This close tending is interrupted only to repel an approaching threat.

A copulatory event commences with a quiet approach of the pair, usually initiated by the mare offering a gesture of invitation that appears to reflexively stimulate closer approach of the stallion. The mare’s invitational gesture typically includes a pause in grazing with a slightly jerky short step forward, often along with a turn to gaze back toward the stallion. Since the stallion usually has been continuously tending and periodically interacting with the mare and her excrement, the immediate precopulatory interaction is usually quite brief and quiet. On the days approaching ovulation, the mare’s behavioral indication of receptivity for copulation includes a combination of holding her head back toward her flank and relaxed flexing of one foreleg slightly off the ground. In quadrupeds, this combination of head back with one forelimb flexed is the common *sign stimulus* indicating receptivity, as if logically signaling “I’m not going to resist or move away.” That posture, unique to the precopulatory situation, appears to initiate the *fixed-action* (or reflexive) mating sequence. The mare may simultaneously take a quick step aimed back toward the stallion’s chest, positioning her hindquarters for mounting. Just before mounting, the stallion almost always nuzzles or lightly nips the flank and/or hocks, which appears to stimulate the mare with her head turned back to reach back to touch the stallion muzzle to muzzle. The copulatory mount with erection is often preceded by one or two brief mounts without erection, apparently as confirmation of receptivity before committed copulation. Each mount is almost always preceded by what seems to be an obligatory nose-to-nose interaction as the mare reaches her head back toward the stallion as he nuzzles or nips the flank or hock. Usually, the only vocalization of the stallion is a soft low nicker just before the copulatory mount, as if to announce to the mare the impending mount with insertion. In all equids, copulation typically involves only one mount with insertion, usually lasting about 20 seconds from insertion to ejaculation and less than 45 seconds from mount to dismount. As ejaculation commences, the stallion relaxes and remains

mounted for many seconds. As the stallion rouses from this rest, the mare usually steps forward such that the stallion slides gently down from her hindquarters to land softly to the ground. The stallion then continues closely tending the mare, investigating and covering any spilled ejaculate or urine.

Another important behavioral characteristic common among open-plains prey species is *stoicism*. Stoicism can easily be misunderstood as the absence of pain. It is not that the animal does not experience pain, but that the behavioral signs of pain and disability have evolved in these species to be relatively subtle and inconspicuous to predators. This is certainly the case with equids.

2. Alternate Male Breeding Strategies

In ethology, male breeding strategies refer to the system by which males gain access to breeding. Examples of male breeding strategies are harem formation and maintenance, pair-bonding, establishment and maintenance of a territory, and opportunistic or sneak breeding [2]. Within a species, there are usually various alternate breeding strategies. Male breeding strategies are somewhat plastic, in that they can change within a population over time with changing population characteristics or environmental and social conditions. Similarly, over a breeding lifetime, a particular individual may transition from one breeding strategy to another with changing social conditions or may engage in more than one strategy during the same period. For most horse populations living under natural conditions, two breeding strategies are seen. One involves maintaining a harem and an alternate strategy is *opportunistic* or *sneak breeding*.

Much has been written about the behavior of harem and nonharem stallions and the implications for management of domestic stallions [3]. The alternate stallion breeding strategy of sneak breeding generally involves bachelors as opposed to established harem stallions. The usual female targets of bachelor stallion sneak breeding are young fillies still living within their natal band or in transition from their natal band to a permanent harem band. There are certain characteristics of sneak breeding behavior that are distinct from harem breeding. As the terminology implies, sneak breeding behavior is especially quiet and stealthy, so as to avoid interruption and eviction by harem stallions or other opportunistic competitors. Vocalization of any type, even the low soft nicker “announcement” of imminent mounting, is rare. Sneak breeding is typically limited to only one or a few copulations that are close to ovulation, when a mare’s fertility is greatest and attention-getting resistance may be less likely. This is in contrast to harem stallion style breeding, which occurs many times per day as a mare’s receptivity permits.

Another characteristic of sneak breeding is behavioral and morphologic “disguises,” such as juvenile and feminine postures and appeasement behaviors. In horses, juvenile behaviors of sneak breeders can include play fighting with juveniles on the edge of the harem band and object play with the tail of the mare similar to that seen in foals and yearlings dawdling at foot. Appeasement postures include the submissive nursing posture and champing. Feminine

postures of sneak breeding stallions include a quiet gait with head low with relaxed neck and tail posture (as opposed to the strutting arched neck posture of a stallion during sexual approach or intermale interactions) typical of relaxed grazing mares than of a mature stallion.

3. Example of the Shy, Slow, or Inconsistent Domestic Breeding Stallion

Among domestically bred stallions, one of the common types of breeding behavior problems involves low interest, slow arousal, or inconsistent response. These stallions are typically described by any combination of terms such as shy, quiet, slow, “low libido,” tentative, finicky, easily distracted (“bird watchers”), playful with the handler, or aggressive with the mare or handler in spite of low sexual response. These stallions may show classic approach-avoidance motivational conflict behaviors, as if wanting to, but afraid to breed. Observable signs of this state include an “anxious eye” facial expression, tongue extensions, licking, chewing, yawning, and defecation, none of which are normally expressed in a breeding context. These stallions may quietly achieve erection, but detumesce at the slightest distraction. Some have slow or variable interest and response when initially being introduced to breeding, and then, after one or two successful breedings, proceed to consistently maintain adequate, or even excellent, interest, arousal, and response. Others continue as experienced breeders with a tendency for generally low, slow, or inconsistent interest, arousal, and response. The most challenging subset are those stallions that show no or little interest with most mares, but occasionally respond instantaneously, quickly, and quietly with particular mares, just as a sneak breeder under natural conditions “bides his time,” as if waiting for conditions to be just right before taking the risk. It is common for these stallions to tend to lapse into playful nipping of the mare or handler, and if disciplined for nipping while forced to stay near the mare, the aggression may become less playful and more sour or savage.

The ethological characteristics of open-plains grazers and behaviors characteristic of the alternate sneak breeding strategy can provide valuable insight into problematically low or inconsistent sexual interest, arousal, or response of a domestically managed stallion. An appreciation of the specific behaviors exhibited can not only help to differentiate the specific ethological root cause of a problem behavior, but can then usually inspire simple and effective management interventions. That understanding can also guide the clinician when considering management changes and pharmacologic aids. For example, significant discomfort that can logically affect breeding behavior is often difficult to recognize. Moreover, the importance of discomfort as a factor in tentative or reluctant breeding behavior is often underestimated, particularly for novice breeders who have not yet gained confidence with the various suboptimal conditions of the domestic breeding environment. So, a wise first step in evaluating breeding behavior problems in stallions, particularly slow starting novice stallions, is to aggressively evaluate and attempt to alleviate any potential sources of discomfort. Examples of commonly unrecognized sources of physical discomfort that can adversely affect sexual interest

and response include sore feet, sore back, dental discomfort, gastric ulcers, and respiratory issues. Direct observation of the horse in real time may not be as revealing of discomfort as evaluating a videotaped sample of the horse at rest in a stall without people present [4]. Video samples with alternating periods with and without people in the vicinity can be especially useful in identifying subtle behavioral signs of discomfort in contrast to appearing comfortable whenever people approach. Another advantage of video is that, when viewed in fast forward, the rapid repetition tends to make subtle discomfort behaviors more obvious.

Another example of an ethology-based recommendation for domestic stallions concerns the ability for interspecies communication of fear and anxiety, or alternatively, relaxation and confidence. Especially for slow, insecure stallions, breeding behavior often appears especially affected by the emotional states of people and other animals in their environment. Thus, a reasonable recommendation is for quiet, calmly confident stallion handling teams skilled in nonconfrontational low-stress, low-fear, and primarily positive handling methods. This is particularly the case for stallions with behavioral indications of the alternate sneak breeding strategy. It can logically be assumed that any fear, anger, frustration, and disappointment of handlers or observers will likely be perceived by the stallion, adding to his tentativeness. Similarly, calm confidence with minimal active attention to the stallion will likely improve his confidence. It is also helpful to avoid exposure to other animals that may be stressed, including the stimulus mare or any nearby horses that, for example, may be emitting stress vocalizations.

There are many additional examples of ethology-based recommendations that can be helpful for slow novice or experienced stallions and particularly for stallions that appear to be in the sneak breeder mode. Based on clinical experience, the following are examples of the most generally useful recommendations.

- a. Housing the stallion as far away as possible from other stallions and with as much exposure as possible to mares generally increases sexual interest. Testosterone levels generally rise naturally with removal from stallions and exposure to mares. Although direct continuous access in a safely designed pasture breeding arrangement may be the most efficient option, in most situations, managers are reluctant to consider turning a stallion out with mares. Housing a stallion along a safe fence line with mares in an adjacent pasture or in a stable with mares in stalls all around is a good second choice for most stallions. In that case, it can be helpful to expose the stallion to the urine and feces of cycling mares by moving urine-soiled bedding or feces to the stallion as many times per day as possible.
- b. In addition, it can be further helpful to provide the stallion opportunity to express dominance behavior toward obviously more submissive males. Yearling colts or quiet geldings with the problem breeder positioned between them and mares will often elicit behavior indicating that the problem stallion is showing dominant social behavior toward the submissive males. Examples of these dominance behaviors include periodic

- posturing and head threats directed toward those submissive males or marking the common boundary with fecal piles.
- c. Insecure stallions typically do progress most efficiently when breeding is done in the stallion's familiar housing area. Bringing the mare to the stallion, rather than the stallion to the mare, is also often helpful. Alternately, a breeding area out of the sight, sound, or residual odors of other mature stallions will likely be less intimidating than a common breeding area used by other stallions.
 - d. Naturally cycling mares (without luteolytic or ovulation induction agents) that are close to ovulation almost always elicit a greater response than ovariectomized mares or intact cycling mares that have had their cycle manipulated. This is true for most stallions, but especially conspicuous with most stallions lacking confidence or with inadequate arousal and response.
 - e. Use of minimal restraint on the mare will enable expression of natural postures and gestures that are more stimulating to most stallions. A lip or ear twitch not only precludes the naturally stimulating mating postures and mount invitation gesture, but often provokes a nonnaturally occurring profile with the head high, clamped tail, and ears back posture that more closely resembles an aggressive posture. Hobbles and breeding boots provoke a nonnatural goose-stepping gait that can appear startling or even threatening to any stallion when first exposed to the abnormal gait.
 - f. Avoiding any washing of the mare's perineal area or wrapping her tail will present the most stimulating natural odors and appearance.
 - g. Avoiding exposure to odor residues of other stallions on any mares to be used as stimulus mares or mares to be bred will limit risk of intimidation. While it is tempting to evaluate estrus by exposure or test mounting by other stallions, the residual stallion odors can logically be threatening to an insecure stallion.
 - h. To initiate and maintain the stallion's sexual focus on the mare, try moving the mare slowly forward ahead of the stallion, in short steps with slightly jerky stops that mimic the grazing movement of an estrus mare, while allowing the stallion to freely follow a stride or two behind her in the manner that simulates the natural tending behavior of a stallion with an estrus mare. After a minute or so of this simulated tending, allow the mare to turn her head back to express the natural invitation gesture. If she does not assume that posture on her own, gently guiding her to turn her head back can often adequately simulate the invitation gesture to evoke a spark of copulatory interest from the stallion.
 - i. If the stallion lapses into prolonged nipping of the mare or playful aggression with the handler or "zones out" with gazing off into the distance, yawning, or assuming a standing rest posture, initiate some behavior of the mare that naturally draws his positive attention back to her. A quick step forward or back of the mare or turn of the mare's head back toward the stallion may be effective. Reprimanding the stallion for nipping or any of these behaviors that naturally reflect the approach-avoidance conflict state is usually counterproductive. Reprimands usually only draw focus to the handler rather than to the mare and often evoke play nipping of the handler that if not ignored can quickly accelerate to more intermale sparring behaviors including more serious biting, rearing, and striking. Even when playful, these behaviors are difficult to ignore. Reprimand of an intensity sufficient to interrupt play fighting is likely to further erode the stallion's confidence. For nipping the mare, in some instances, it can be effective to try to set a "boundary" of the lead by giving just enough slack that the stallion can almost but not quite contact the mare. This will enable the stallion to "self-check" as the slack runs out, rather than being jerked back by the handler. In addition, it is recommended to avoid the common tendency to push the stallion's head back away from the handler and to the mare's perineum. This is rarely effective at drawing the stallion's sexual focus back to the mare. Rather, in most instances, that action appears to be perceived by the stallion as another juvenile intermale play initiation gesture and so tends to provoke resumption of nipping at the handler. The same action of pushing the stallion's face toward the perineum is common when a stallion is looking bored or uninterested in the mare, usually with the same unproductive result of evoking bachelor stallion type intermale nipping behavior directed toward the handler.
 - j. Mature mares may not respond well with insecure stallions. Especially until the stallion builds his confidence and shows more obvious stallion-like interest, younger and maiden mares may not only appear more responsive to the sneak breeder style, but often appear immediately more stimulating to the insecure stallion.
 - k. Breeding in an open paddock with view of the horizon may be less intimidating to some stallions than an indoor confined area where the stallion may feel trapped.
 - l. Allowing and encouraging one or more mounts without erection is recommended. Mounts without erection represent normal positive progression through the precopulatory sequence. If the stallion appears to get stalled with repeated mounts without erection, progress may be made by gently delaying mounting by actively redirecting the stallion's focus with an approach that often favors erection. For example, a nose-to-nose approach or standing off a short distance from the mare can sometimes promote erection in advance of mounting. As novice stallions progress, they may also mount with a reasonably rigid erection but immediately lose erection or fail to insert as if not certain what to do next. Or they may achieve erection but then not mount, even when the mare offers the invitation gestures. In such instances, it can often be helpful to manually stimulate the glans penis or apply an artificial vagina to the erect penis, which may stimulate the mounting and or thrusting reflex. With the uninterrupted positive stimulation, many will continue with well-coordinated thrusting.
 - m. For a stallion that fails to maintain focus sufficient to show signs of sexual interest or arousal, it is worth trying to retreat a short distance from the mare and stand quietly with the stallion on a loose lead, with handlers acting as if they are ignoring him as he stands there appearing uninterested. Some sneak breeders are better

able to respond with erection at a “safe” distance, and then once erect are able to “sneak in” for the mount.

- n. Anxiolytics can be effective by increasing motivation and releasing inhibition of innate goal-directed behaviors. Along with sexual behavior, aggressive behavior may similarly be released from inhibition, which can complicate handling and/or adversely affect the cooperation of the mare.
- o. Increasing androgens by administering GnRH, hCG, or testosterone can in many instances increase sexual motivation and apparent confidence. Aggressive tendencies also increase with increased androgens, often in advance of increased sexual motivation. With testosterone supplementation or aggressive GnRH or hCG regimens, adverse effects on the endogenous endocrine physiology and sperm production are of considerable concern. For these reasons, when time permits, increasing androgens naturally by exposure to mares and relief from exposure to dominant stallions is often more efficient and less problematic than supplementation.

4. Summary Comments

An understanding of basic ethology and applied animal behavior science concepts can provide valuable insight into the most of the common breeding behavior problems of domestically managed stallions. Based on that insight,

recommendations can be made for resolving or more efficiently managing those problems. The slow starting novice breeder is just one example illustrating this approach. Other common breeding behavior problems, such as extremely urgent or aggressive breeding behavior tendencies, could similarly be prevented or more efficiently managed and resolved when understood in light of applied animal behavior science. In addition to understanding and addressing specific breeding behavior problems, applying basic ethological and behavior science concepts on breeding farms often improve general efficiency and safety. As equine reproduction scientists and clinicians, we should encourage animal science and veterinary training programs to provide greater awareness and access to this enormously relevant body of knowledge.

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