

Musculoskeletal Disease and Subfertility in Breeding Stallions

Benson B. Martin¹ and Sue M. McDonnell²

Sections of Sports Medicine and Imaging¹ and Medicine and Reproduction²

Department of Clinical Studies - New Bolton Center

University of Pennsylvania School of Veterinary Medicine

Kennett Square, Pennsylvania 19348

Significant sections of this paper were taken from Martin BB, McDonnell SM and Love

CC; "Effects of Musculoskeletal and Neurologic Diseases on Breeding Performance in

Breeding Stallions" Comp Cont Ed; Vol 20, No 10 October 1998

Introduction: Maintaining musculoskeletal soundness is an important concern for breeding stallions. In addressing musculoskeletal health and disease on the breeding farm, extraordinary longevity is the usual expectation. Stallions on breeding farms may include a high percentage of animals with pre-existing musculoskeletal disease related to previous training and performance. In this paper, we describe the more common musculoskeletal diseases in breeding stallions, along with diagnostic, therapeutic, and preventative measures specific to the particular needs of the breeding farm. . Libido, mounting, thrusting, and ejaculatory dysfunction represent a major cause of poor breeding performance in stallions. Musculoskeletal and neurologic disease account for as much as 50% of these problems.

The Examination of the Stallion: A complete history includes: signalment, performance career, duration and details of breeding experience, presenting problem and associated details, medical history, medication, nutrition, and environment including housing, breeding facilities (flooring, dummy, etc.) and breeding protocol (semen collection technique, stallion handling).

A complete musculoskeletal evaluation in the breeding stallion ideally begins with a routine breeding soundness examination, as outlined by the Society of Theriogenology. Breeding stallions are typically among the most challenging to handle for examination. Even stallions that may have been more compliant with examination during periods of training and racing may require more skillful handling for lameness examination. It is always wise to examine the horse in an area away from other horses, preferably in a secluded place, if possible. An experienced breeding stallion handler with appropriate restraint aids is the ideal. In some cases, a traditional examination for subtle lameness may be futile. It may be necessary to rely on observations of the horse during paddock exercise or breeding activities. For further diagnostic procedures (radiography, ultrasonography, diagnostic anesthesia) xylazine or detomidine and butorphanol may be necessary.

Basic lameness and neurologic examinations.

A basic lameness examination includes observing the stallion at a walk in hand away from you and towards you on an even surface. We prefer a hard, flat surface but an even grass surface will suffice. The stallion is then jogged in hand and any abnormalities noted. Flexion tests of the fetlocks, carpi and hocks may be performed to elicit a response. A lameness examination should also include examination of the feet with hoof testers and palpation of the back.

A basic neurologic examination can be performed at the same time. This includes circling the horse to the left and right in a tight circle looking for circumduction of the hind legs seen most commonly in Congenital Vertebral Malformation (**CVM**). It includes evaluating the facial muscles, overall muscle symmetry and unusual lameness patterns seen more commonly in Equine Protozoal Myelitis (**EPM**). The horse should also be walked in a serpentine fashion, walked with its head held high while walking down a slight incline and a tail-pull test done to either side to evaluate the hind end for weakness. In many cases, the presenting complaint is difficulty breeding, in which case it is most useful to observe the horse for lameness and neurologic signs while teasing and particularly during mounting, thrusting, and dismount. Specific findings suggestive of a musculoskeletal or neurologic problem would be failure to squarely couple and thrust with smooth, rhythmic pelvic action; asymmetric hind limb weight bearing and thrusting; failure to properly flex or use the neck and/or back; abnormal tail posture; anxious look in eye and/or atypical ear postures suggesting discomfort or distraction; failure to grasp securely with the forelimbs; lateral instability; falling during thrusting or dismount; weak, thready, or irregular ejaculatory pulses (often variable from day to day); and lameness (front or hind) after breeding. Other common manifestations of musculoskeletal pain are reluctance to mount or dismount, early dismount, squealing during dismount, or savaging the broodmare or handler during or immediately after mounting.

Based on the combined findings of the above examinations, additional tests may be useful. These include diagnostic analgesia and radiography. Diagnostic anesthesia may unnecessary. In some cases it cannot be performed. Other diagnostic tests including ultrasonography, hematology for creatinine phosphokinase (0 min, 60 min post breeding), cerebrospinal fluid and serum evaluation for equine protozoal myelitis titers, and nuclear scintigraphy may be useful. Ultrasonographic evaluation of the pelvic aorta is useful in cases of hindlimb weakness and pain seen during active breeding.

Of particular value is frame-by-frame videotape analysis of breeding behavior. This can often provide useful insight into specific areas of pain or discomfort and can help to identify handling factors that enhance or impair performance.

Specific Diagnostic Considerations and Therapy

Sore Back: For the breeding stallion a sore back is typically associated with inadequate coupling and thrusting during breeding. The stallion may fail to “wrap” the pelvis and/or neck around the broodmare or dummy. He may tend to hold the head off the neck of the broodmare and paddle with the forelimbs. Thrusting is often of irregular depth and rhythm. A sore back and neck can be acute or chronic. If not treated aggressively, it tends to be a chronic condition exacerbated by breeding. Other than a history of a change in breeding performance, and the specific breeding behavior described, the most useful

diagnostic procedure is palpation of the epaxial and gluteal muscles, looking for signs of fasciculation greater than two seconds or obvious pain.

The most important step in the treatment of chronic back pain is to determine the primary cause and initiate the appropriate treatment. Pain can be secondary to another musculoskeletal cause such as osteoarthritis, a heavy breeding schedule, poor footing, poor shoeing, poor fitting of the breeding dummy to the stallion, or some other cause that can be remedied. Chronic pack pain may be best treated using acupuncture once weekly for eight weeks and then repeated every three to four weeks or as needed. Acupuncture therapy may be combined with Non-steroidal Anti-inflammatory Drug (**NSAID**) therapy, or **NSAID** therapy alone may be tried first.

Osteoarthritis: The stallion with osteoarthritis appears stiff and painful during breeding, sometimes with indication of specific affected joints. In the forelimb the fetlock and carpus are most commonly affected. In the hindlimb the hocks are the most commonly affected. For stallions with mild to moderate disease, the stiffness is often more pronounced after rest and improves with exercise. The key to continued breeding performance in osteoarthritis is pain control. The most common drugs used in the medical management of pain in horses are non-steroidal anti-inflammatory drugs (**NSAID**). We recommend initial treatment with phenylbutazone, which is usually administered orally in tablet, paste, or granular form. Other commonly used medications include flunixin meglumine and ketoprofen. We recommend initial treatment with oral phenylbutazone administered at a dose of 1.5 - 2 grams orally BID for 4-5 days then titrated to 1 gram orally twice daily for an additional 5-7 days. Ideally, this should be accompanied by a period of sexual and general rest if possible. In our experience this has been the most effective pain treatment. Significant improvement may not be evident for as long as 5 to 10 days into treatment. If the treatment is helpful, the stallion may be administered low doses of phenylbutazone with no measurable effect on sperm production or testicular size. However, treated horses should be monitored for signs of phenylbutazone toxicity including colic, loss of appetite, diarrhea, dependent edema and mucosal ulceration or renal disease. On occasion, another type of **NSAID**, such as ketoprofen, may be helpful. Occasionally, the management of osteoarthritis may include intra-articular medications including corticosteroids, polysulfated glycosaminoglycans (Adequan) or sodium hyaluron (Hylartin-V). Polysulfated glycosaminoglycans (Adequan) and intravenous sodium hyaluron (Legend) can also be administered intramuscularly and intravenously, respectively.

Neurologic Disease: In general, during breeding neurologic disease regardless of specific cause is typically most evident during mounting. The stallion with affected hindlimbs typically is awkward during intromission and thrusting, stepping on his hind feet, bearing weight unevenly during thrusting, sometimes becoming “high sided” or falling. Ejaculation is typically retarded, in that the horse appears to require extraordinary effort to ejaculate.

Some stallions may come from the racetrack or from a performance career and have subtle neurologic signs similar to CVM. These signs may remain the same, may worsen gradually or exacerbate until the stallion is a candidate for further evaluation

including a more complete neurologic examination, myelogram and in rare cases, surgical intervention to extend the breeding life of the stallion, if its value warrants.

Treatment and management of **CVM** in adult horses can be challenging. Occasionally, surgery may be warranted and performed in adult breeding stallions and recovery may require several months. More commonly, medical treatment includes **NSAIDs** and acupuncture for alleviation of pain associated with breeding. Management methods are extremely important and include good footing, proper shoeing, proper positioning of the broodmare or dummy mount, ground collection of semen, and pharmacologic aids to ejaculation when necessary. In one study, several horses with moderate to severe signs of **CVM** or **EPM** were managed successfully.

The management of horses with **EPM** is similar to that for cervical vertebral malformation. There is no surgical treatment. However, medical management includes the use of pyrimethamine and sulfadiazine or sulfamethoxazole administered on a daily basis for at least 60-90 days. One occasional side effect of this therapy is anemia. Accordingly, daily oral administration of folate supplement and vitamin E are advised. Recent work indicates this treatment does not adversely affect sperm production. Interestingly, in that work normal stallions developed transient hindlimb incoordination evident during mounting from about 30 to 60 days into treatment.

Breeding stallions with neurologic disease can be successfully managed but special precautions must be taken during collection of semen or breeding to protect the stallion, the broodmare and the personnel working around the stallion. It is particularly important to have adequate footing and that the broodmare or phantom are properly positioned so that there is less risk of the stallion falling. These stallions typically have poor lateral stability. For collection of semen, a mount broodmare that doesn't wiggle side-to-side is usually best for such stallions. If a broodmare to be bred should move side-to-side, providing lateral support at the hips of the stallion can be helpful. A dummy mount may be better in this regard, but typically elicits less vigorous thrusting than a live mount broodmare.

Rhabdomyolysis: Rhabdomyolysis is often clearly evident upon breeding exertion, either during or after thrusting. The typical breeding scenario is inefficient thrusting on early mounts followed with increasing discomfort leading to rapid mounting and dismounting. The horse may sweat profusely and have increased respiratory rate with apparent discomfort. They have a typical anxious and/or sour expression.

Rhabdomyolysis, evidenced by lameness, pain, sweating, firm muscle, and markedly elevated creatinine kinase (**CK**), can be the primary cause of poor breeding performance. In horses that have acute Rhabdomyolysis that exhibit colic, anxious sweating, and have very firm muscles combined with elevated muscle enzymes, it may be useful to administer 10-20mg Acepromazine intravenously to control anxiety, 10-20 liters balanced electrolyte solution intravenously, keep the horse confined to a stall, and monitor his progress until the crisis is over. Methocarbamol may also be helpful in some horses. In horses with chronic Rhabdomyolysis, it may be better to alter their diet to include low quality hay and a reduced volume of high carbohydrate feed and place the horse on a diet of primarily hay and high quality low protein, low carbohydrate feed.

Laminitis: The diagnosis of laminitis in the breeding stallion is often straightforward. More common primary causes include, orthopedic injuries, colitis, Potomac fever, Salmonella and other infectious diseases, which can predispose the release of endotoxins or cause skeletal imbalance and severe pain. The treatment of acute laminitis includes treating the primary disease, support of the distal phalanx, decreasing blood pressure, treatment of inflammation and management of pain.

Corrective trimming and shoeing are also considered important. Frog support and reducing the pull of the deep flexor tendon on the distal phalanx are important. Frog support may include the use of frog support pads, felt pads, Styrofoam board or custom made orthotic shoes. The pads are easily applied and removed using duct tape. This allows application, observation of the horse's comfort and changing the support easily. It is important, in our experience to make gradual adjustments in the horse's shoeing. This means gradual changes in the hoof angle, removal of shoes and any other adjustment that may be made. A horse with laminitis is in a precarious state at best and a rapid change could result in the demise of the horse.

Chronic laminitis results in movement of the distal phalanx away from the dorsal hoof wall and can be an important in breeding stallions and is a radiographic diagnosis. Horses may exhibit a recurrence of active laminitis or experience stable chronic laminitis. Horses may exhibit a stiff gait or more overt lameness in one or both front feet. They may be sensitive to hoof testers and may have drainage from the coronary band or sole. Chronic abscessation may be present.

Aorto-iliac Thrombosis: The stallion with aorto-iliac thrombosis may have low libido, as well as erection, and/or ejaculatory dysfunction. The key set of signs suggesting aorto-iliac disease in the breeding stallion is delayed ejaculation (multiple mounts and greater than 12 thrusts); progressive hindlimb weakness and/or pain during thrusting resulting in "camping under" the broodmare or dummy; and difficulty backing up to dismount. Erection aberrations can include delayed or rapid tumescence or detumescence, or loss of erection during thrusting.

Breeding management and handling.

Breeding schedule: For any hand-bred stallion, and particularly for a stallion with musculoskeletal concerns, an important goal of breeding management is to minimize the work of each breeding as well as the cumulative work of the season. For stallions that are breeding by artificial insemination, a great deal can be done to reduce the breeding schedule. For most stallions with good to excellent longevity of sperm motility, a reasonable book of broodmare can be served with collection of semen limited to two or three times weekly.

Maintaining ideal levels of libido in the lame stallion: An important consideration for the disabled or chronically painful stallion is to maintain good to high libido. This will help the stallion to ejaculate more efficiently in the face of pain, neurologic dysfunction, or musculoskeletal disability. In addition to factors discussed earlier, there are well-tested management schemes and pharmacologic aids to consider for enhancing libido. In general, the most useful management tool to maintain high libido in a stabled stallion is

housing near broodmare and away from stallions. Alternatively, ample daily teasing exposure to broodmare can similarly boost libido of most stallions. Treatment with GnRH can be useful to boost libido via increased circulating testicular steroids. Another useful medication for preserving or enhancing libido in breeding stallions is diazepam, which effectively inhibits the memory of pain associated with breeding.

Breeding shed handling considerations: The placement and restraint of the broodmare or the dummy mount conditions can be critical factors for the disabled stallion. Most disabled stallions can benefit from have the broodmare or dummy mount slightly down-grade. This can reduce the work of the hind limbs in supporting the body weight. For a live mount broodmare, this is best achieved with a sloping ramp. A common practice for accommodating the disabled stallion is to build a height differential with mats, or a pit for the broodmare. These work well only if the broodmare remains stationary. Excellent footing the breeding area that is customized to the stallion's particular needs can greatly improve breeding efficiency of the disabled stallion. Features of general importance for disabled stallions include non-slip, even when wet; seamless even surfaces to avoid stumbling; and moderate cushion. Stallions with hind limb weakness or incoordination tend to "camp under the broodmare." For these stallions, the footing behind the broodmare is critical to maximize their ability to correct. While some cushion is good, it should not be so spongy or deep that the stallion gets caught up or buried in the substrate. Stallions with sore feet, especially front feet, benefit from a softer footing, particularly a soft landing during dismount for front-end problems or sore front feet. Heavy sod on well-drained soil is often the simplest and best outdoor footing. Composite rubber athletic surfaces, particularly if poured and seamless make ideal breeding surfaces. General handling recommendations for disabled stallions is a smooth and respectful organized manner. These often do better if given ample freedom about the head, particularly during mounting and thrusting. This will allow the stallion to make postural adjustments to best accommodate his disability. Enforcing routines that work well for sound stallions, such as always keeping the head on the near side of the broodmare or dummy mount, can sometimes significantly discourage the disabled horse. For severely ataxic, weak, or uncomfortable stallions, thrusting and ejaculation can be facilitated with gentle stabilizing assistance or "spotting" during breeding. We recommend an assistant applying gentle pressure with the hands on one or both hips to support the stallion from falling. Some stallions will tolerate support from the rear, for example with a wide strap held from either side behind the buttocks.

The one-mount rule: For longevity of a disabled stallion through a season or through a breeding career, we recommend approaching breeding with the goal of achieving ejaculation with one mount. Whenever possible, we further recommend that if the horse does not ejaculate in one mount, or at most two mounts, he is taken back to the stall or paddock to rest and return fresh. Our experience has been that this strategy often effectively produced a greater number of successful mounts than the approach of repeated mounts. This strategy works best when all conditions are optimized for the first mount. Generally, we consider optimum conditions to be the horse at the highest level of arousal possible for safe handling, the mount well-positioned and optimally restrained if it is a

live broodmare, the artificial vagina in optimum pressure and temperature for semen collection, and the handling team in top form and focused. If it is known that particular procedures or medications can make the horse more comfortable, or enhance libido, or reduce the ejaculatory threshold, we typically recommend incorporating those from the start while the horse is fresh, rather than seeing how things go for a few mounts before going to the effort.

Ground semen collections: For stallions that breed by semen collection, a valuable alternative to mounting is ground semen collection. Most stallions with good to excellent libido are excellent candidates for semen collection while standing on the ground or even while supported in a sling. This technique is particularly useful in cases of aorto-iliac thrombosis, Cervical Vertebral Malformation, Equine Protozoal Myelitis, and other conditions with hindlimb instability or weakness.

Pharmacologically-induced (or “chemical”) ex copula ejaculation: For stallions that breed by artificial insemination, a useful technique to consider for the disabled stallion is pharmacologically induced ejaculation. These methods employ alpha-adrenergic agents to induce an ejaculation out side of the sexual situation, usually with the stallion at rest in his stall. A number of agents and regimens have been studied. Currently, the generally most effective regimen (50-70% of attempts) is a combination of imipramine hydrochloride administered orally about two hours before intravenous xylazine hydrochloride. For a particular stallion, best results can be achieved by titrating through a range of doses for each component drug.

Comprehensive Management of the Breeding Stallion with Musculoskeletal Disease:

The useful breeding career of a stallion with lameness problems can often be significantly prolonged with coordinated veterinary care and breeding management. Particular concerns and challenges include 1) controlling pain without adversely affecting libido or fertility, 2) maintaining a level of fitness adequate for the breeding work without exacerbating lameness, 3) employing available management and veterinary techniques to enhance libido, ejaculatory function, and to reduce the work of each breeding, and 4) managing the breeding book to maximize breeding value, while not exacerbating the lameness. For the disabled breeding stallion, it is well worth proactively designing a strategy for staying ahead of pain, dysfunction, and lowered fertility leading to greater effort, greater cumulative wear-and-tear, that spirals rapidly downward toward failure.

Therapeutic Strategies: Our general approach to managing any of these conditions in the breeding stallion involves formulating a specific plan considering pharmacological therapy, acupuncture, corrective shoeing, breeding management changes, specific behavior modification, and other management considerations such as exercise and nutrition. In our experience, successful therapy is most likely if all of these techniques are considered and implemented simultaneously rather than individually. The history, breeding farm conditions, value and use of the stallion, and available veterinary care are considered. We generally involve sports medicine, reproduction, and behavior specialists formulating a specific strategy.

Summary: Successful management of the breeding can be best accomplished, in our opinion, by a team approach when needed. This includes people with expertise in breeding, behavior, musculoskeletal disease, neurologic disease and an excellent farrier. The team approach requires an open mind, willingness for open discussion without rancor and a unified approach towards a common goal of delivering the sperm to the egg!

References available upon request.