

Strength & Flexibility

There are a variety of ways to help your horse be stronger and less stiff.

By Nancy S. Loving, DVM

For an avid horse person, little takes the breath away like watching an athletic horse performing his job in the best of style: The dressage horse suspended in perfect piaffe, the cutting horse hunkered low as he turns a calf, the reining horse spinning and sprinting with fluid ease, the jumping horse in perfect form as he launches his half-ton mass to fly through the air. For an athletic horse to execute a thrilling performance, he must feel comfortable in body and impart strength to his efforts.

Building muscle strength and flexibility is an important part of developing a horse's performance, and the principles of doing this are steeped in science and techniques based on results. A starting point in all cases is to have your veterinarian complete a thorough soundness exam to put any musculoskeletal pain concerns to rest. If problems are discovered on exam, they must be addressed before training can produce success. In multiple studies that have reviewed complaints of back pain, often the horse is afflicted with limb lameness as the primary problem, especially in the hocks or stifles; commonly, back pain is a secondary consequence.

Occurrence of true back pain seems to be relatively uncommon, but it might be underdiagnosed. When it does occur, the likeliest locations include impingement of dorsal spinous processes of the vertebrae, osteoarthritis in the vertebral joints, or problems in the sacroiliac (SI) region where the vertebral spine joins the pelvis. The SI joint is fairly stable through its connection with the rigid pelvis. In this way, muscle contractions of the rear limbs are transmitted through a horse's trunk and back to propel him forward across the ground, up and over a jump, or in sudden twists and turns or stops. Ligament and muscle injuries also occur in the back. It is possible to avoid muscle and ligament strain in the back and hindquarters by developing a muscle-strengthening program that incorporates training exercises and conditioning.

Muscle Action

For movement and locomotion to occur, muscle contractions generate the force to move the skeleton. Every muscle in the body anchors to bone at its site of origin; then at the other end at a distance from the body's trunk spanning a joint, each muscle inserts on another bone through tendon attachments. As a muscle contracts, it folds onto itself and shortens, thereby pulling the bone to which it attaches in the direction of the contraction.

For a muscle to improve in tone and strength, it must undergo some form of forceful activity that stimulates more than 75% of the muscle fibers in maximum tension. Kevin Haussler, DVM, DC, PhD, assistant professor in complementary and alternative medicine at Colorado State University's Equine Orthopaedic Research Center, has studied and taught biomechanics, back function, and chiropractic for years. He says, "The main mechanism for increasing muscle strength is by increasing each individual muscle fiber size (hypertrophy or enlargement) rather than fiber number (hyperplasia)."

He continues, "For a muscle fiber to increase in size, it must be recruited during a particular exercise with high tension or stretch applied to stimulate growth. For example, endurance training is performed at relatively slow speeds and low intensities using mostly slow-twitch muscle fiber types. Low-intensity exercise stimulates little tension within the muscle, so muscle fiber growth is limited with little increase in strength, but with increased muscle endurance instead. With jumping or racing exercises,

most fibers are recruited and muscle tension is high. Therefore, muscle fibers grow and muscle strength increases."

Strength Training

A rider can apply the concept of resistance to achieve maximal tension for strength training. In people, strength training has been reported to reduce sports injuries by half. Not only does muscle strength improve a horse's performance, but strong muscles also protect against musculoskeletal injury by stabilizing joints and reducing strain on tendons and ligaments. Hilary Clayton, BVMS, PhD, MRCVS, Mary Anne McPhail Chair at Michigan State University College of Veterinary Medicine and author of *Conditioning Sport Horses*, suggests that strength training is accomplished through various strategies:

- Increase the intensity of a horse's effort by amplifying the force and speed of muscle contractions: The greater the intensity of the effort, the more muscle fibers recruited to do the job.
- Increase the duration of the work effort: For low-intensity output, more repetitions recruit maximum numbers of muscle fibers, whereas high-intensity efforts rely on fewer repetitions to recruit fibers to build strength and power.
- Apply a reasonable frequency of training days per week: Brief, but intense exercise builds strength, provided sufficient recovery time is allowed for tissue repair and rebuilding between bouts.

Clayton recommends the intensity should be appropriate for the type of sport or activity to be performed. She says, "For activities that require strength or power (jumping, rodeo, sprint racing, draft horse pull), exercises are performed at high intensity, but with fewer repetitions. For activities that require less power, but the muscles must contract repeatedly over a long period of time (dressage, endurance), it is appropriate to perform less-intense exercise, but with a larger number of repetitions."

She stresses that care in frequency is important in allowing tissues to repair. "Adaptation to exercise occurs through tissue damage that is repaired to produce a stronger tissue," she explains. "After a strenuous workout, the tissues need time to recover, so the same type of exercise should not be performed day after day."

Further, she notes, "When muscles are fatigued, the horse compensates by recruiting other muscles. If strength training continues after the horse becomes fatigued, the wrong muscles are trained," or they are overloaded and injured.

She advises a common-sense approach: "After an intense workout, allow two to three days recovery. If recovery is too short, there is a danger of injury due to insufficient time for repair. If the interval is too long, the muscles will not adapt to the exercise stimulus. However, rest days do not mean the horse has to stand in the stall--he can do a different type of exercise, hack, or go out in pasture. Variety is key. I think many of the repetitive-use injuries (especially to suspensory ligaments and flexor tendons) are a consequence of doing the same arena work day after day after day."

Clayton recommends starting with strength-training workouts three times per week, then as intensity is increased, the horse is trained twice a week. Once the horse's muscle strength is developed, strength-training exercise once a week is all that is needed to maintain results. On other days of the week, she suggests that the horse should perform "normal" training and other types of exercise. She says, "Results from strength training will be evident within three months, and significant improvements will be seen in six months."

Clayton says, "In the early stages of strength-training, there may appear to be large increases in strength that are actually due to improved neuromuscular coordination in performing the exercises."

Practical Strengthening Exercises

One natural phenomenon, gravity, can help build strength and power and improvements in muscle mass and tone. Gravity creates "resistance" by making a horse work to move his mass, as well as yours, if mounted. This is amplified further when your horse is asked to climb a hill. Resistance exercises are refined by altering difficulty and/or intensity by the angle of the slope, changing gaits, or urging more speed to negotiate the climb. You can train your horse's muscles to incrementally accept more effort, progressively building his strength and power, as well as endurance.

His hindquarters and back are especially well-developed by such gradient training. Anytime you ask your horse to work in high-resistance conditions, you must gradually condition him to avoid straining tendons, ligaments, muscles, or joints.

Another resistance technique is the use of gymnastic jumping grids. Clayton says a single "bounce" (the horse lands from one jump and immediately pushes off the ground for the next, without taking a stride) step between small fences is helpful to improve collected gaits, while a bounce and one or two strides to a higher fence or combination grid can build power.

Similarly, you can use different surfaces to provide drag on your horse's movement. Trotting your horse in shallow water or snow are excellent means of increasing his hind leg lift to increase flexion of joints and muscles in his hindquarters. Water or snow creates drag when the horse swings his leg forward. Sand training can develop muscle strength in a different way. Sand is a shifting medium; the grains move away from each hoofprint, causing your horse to have to step up his muscular effort to move himself along to overcome the "loss" of resistance as the sand gives way.

Response of Muscle Fiber Types

Hausler notes, "Most muscles have a predominance of one muscle fiber type, but adjacent muscles may have very different muscle fiber types and, therefore, very different muscle functions, depending on what type of joint motion is required at the time--joint stabilization for standing for long periods of time versus joint mobilization for rapid bursts of speed to flee from potential predators."

He explains, "In general, there are muscles with slow-twitch fibers that occur in higher numbers in anti-gravity or postural muscles. These muscles would be best trained with slow, constant loading (isometric loading), like working at a walk or trot. Another muscle fiber type is the fast-twitch fiber, which is responsible for rapid, short bursts of contraction. These muscles are best trained with short, repetitive sprints, jumping exercises, or hill work. There is also a third muscle fiber type that has characteristics between the other two types."

Clayton says the value in activating many different muscle groups. "I like to use cross training in the early stages--hills, jumping, some galloping," she says. "As horses move up the competition ladder, conditioning needs to be more specific to prepare the horse for the demands of high-level competition. The challenge is to decide what techniques are most relevant to stimulate the appropriate muscles. This is why I like to use the movements of the sport in an interval-training format with progressive increases in number of reps or intensity of the exercise."

Proprioception

Hausssler says the nervous system provides sensory (pain, touch, vibration, temperature) information, while the motor system produces muscle contractions to move joints. He notes, "A third important function of the nervous system is the control of muscle force production and the sensation of joint position by the proprioceptor (knowing where the limbs are) system."

He says, "This system balances forces between opposing muscles to provide coordinated and effective joint motion while reducing the risk for injuries. Proprioception is also critical for maintenance of equilibrium or balance. As an example, when a horse places his foot on the ground, proprioceptors in the foot and tendons tell the horse's brain whether the foot is on the ground or not, whether the ground is even or uneven, whether the ground is slippery or firm, and whether the body weight is distributed equally between the two front feet. The proprioceptors tell the body if more or less tension needs to be applied to a muscle or tendon to perform a turn or jump and to prevent an unsteady or unstable motion."

When we refer to proprioception in regard to muscle training, we are also talking about the synchronization of a horse's motions to impart natural ability, or "talent." We've all seen those horses that move with apparent ease and seeming relaxation, each motion harmonious and fluid. We compare such stellar performers to others that are clumsy and labored in attempts at similar actions. Sometimes, the "loss" of athletic ability is because it was never present in the first place; the horse is restricted by conformation and genetics. In other cases, a normally nimble athlete loses his proprioceptive advantage due to an injury or due to resistance created by tightening of muscles from discomfort or pain. In these instances, instead of sharing the workload, some muscle groups exert more effort, while others sit idle. The horse then loses power, coordination, and stamina, and might move with a stilted gait and exaggerated effort.

Hausssler remarks, "Proprioception can be improved with specific exercises. A common human sports example is football players training by running through a series of car tires or maze of ropes. If a person places a foot in the right place in the center of the tire, then the entire course can be run through with ease. However, if proprioception or balance is altered, then it would be difficult to place each foot in the center of the tires, making (the athlete) likely to trip and fall down."

Hausssler brings this comparison back to the world of horses: "Proprioceptive training in horses often involves work over ground poles, backing up, work around obstacles, and a gradual progression to cavellettis and jumps."

Hausssler notes how much a horse has the potential to improve: "Warmblood yearlings are a typical example of poor body awareness and incoordination. They step all over you and have no idea where their body or feet are. With consistent proprioceptive training, they may become elite athletes capable of the most athletic demands asked of them."

Suppleness and Flexibility

Hausssler clears up some confusion: "One misconception is the idea of being 'muscle-bound'. We often think that large muscles preclude flexibility. This may be an issue in some humans since we can find ways to increase strength without necessarily increasing flexibility (i.e., by lifting heavy weights repetitively without an accompanying stretching program). But I think that this is very unlikely in horses, since we cannot train horses to have increases in muscle strength without also activating flexibility and neurological mechanisms (proprioception and fiber recruitment) and mental fitness at the same time." If one system functions at a suboptimal level, it can hinder the horse's overall performance.

Hausssler stresses that an increase in muscle mass does not limit speed of contraction, which is dependent on the type of muscle fiber present--slow-twitch, fast-twitch, or a combination of those.

"Muscle contraction is due to nerve excitation (in the brain and spinal cord), nerve connections to the muscle (neuromuscular junction), and also due to contraction of the muscle itself," he explains. "Early increases in strength are largely due to increased nervous activation, whereas subsequent strength improvements are mostly due to increases in muscle hypertrophy."

He emphasizes, "Muscle size, by itself, can limit joint range of motion, but is not a common issue in horses since we have not been able to design exercises that work only one isolated muscle or muscle group without also working other adjacent muscles. It is likely that some horses are stiff or have reduced range of joint motion due to an underlying muscle or joint injury, and not due to the muscle mass itself."

Both Clayton and Hausssler strongly feel that stretching should be used on every athletic (and nonathletic) horse, both before and after exercise. Hausssler says, "Due to the high percentage of horses that live their lives in stalls and are not allowed access to free-range exercise, stiffness (and boredom and stall vices) are common afflictions."

In addition, a rider's weight inherently creates some back contractions and hollowing, while bit contact stiffens a horse through his neck and poll. Both occurrences lead to shortened, stiff steps, and diminishment of natural talent. The goal in suppling a horse is to improve flexibility and range of motion of the joints, as well as lengthening the horse's topline and stride, especially of the hind limbs.

Not all horses are flexible equally or physically symmetrical. When a horse moves crooked, he is moving his hindquarters sideways with little bend in his body. The result is that he is bending less in the joints of the less-developed hind leg, and so he effectively reduces the load on the limb, then never adequately develops strength in that leg. It is important to identify if he is crooked because he is protecting his leg due to musculoskeletal pain, or if it is because of the horse or rider's inability, or both.

Suppling Exercises

All horses should be warmed up well before being asked for more exercise intensity. Clayton urges the incorporation of suppling exercises in any muscle development program. "Passive suppling (stretches while the horse is standing) can be used to target certain areas (e.g., after injury) or to improve range of motion, especially in neck, back, and upper limbs," she says. "Improvements over time can be monitored. However, the forces applied are relatively small compared with those applied during locomotion. Dynamic suppling (lateral and bending exercises) uses the weight of a horse's body or the forces of his own muscles to stretch the joints and soft tissues. As the horse moves, stretching is applied in a more 'natural' manner; the disadvantage is that the trainer has less control over the amount of stretching."

For a hind limb to move outward away from the body requires the ball-and-socket hip joint to have a good range of motion. Lateral exercises are useful to supple the hip joints for lengthening the stride and taking sideways steps. Movements that encourage flexion of the hip joints serve to engage the hindquarters and to lower the croup, and they result in a better degree of collection and/or mobility for rapid turns. These movements have great application for dressage, cutting, and reining horses.

Clayton emphasizes the use of "baited" stretches to encourage a horse to reach for a carrot or apple. "One of the interesting things is that baited stretches not only encourage suppleness, but they also activate some back and abdominal muscles important for stabilizing the spine," she says.

Take-Home Message

The type of exercise program you develop will depend whether you are working on strengthening or lengthening the muscles. Take time to work with an experienced person who understands equine fitness, in order to help your horse safely perform to his utmost potential.