

BUILDING BLOCKS

BY STEVE FISCH, DVM

Build a solid foundation for a winning equine conditioning program by selecting the right genetics, conformation and nutrition.



TYLER STOCKTON/BOBWIRES

A major key to winning is finishing well. If the horse has enough anaerobic nutritional pathways, it doesn't have to switch to aerobic metabolism midway through the run or race, allowing it to finish strong and fast.

THERE ARE SEVERAL THEORIES FOR CONDITIONING SPRINTERS. However, for a conditioning program to be successful, the raw product has to be prepared for conditioning. In my mind, conditioning is one of four important factors in a successful sprinting program. If the first three factors are not in place, then no matter what conditioning program is used, it has a less-than-optimum chance for success. I like to start at the foundation of the program, which is breeding and pedigree. Then comes conformation and nutrition.

The Importance of Pedigree

The reason pedigree is important to a sprinting program is because you can't make a sprinter out of a horse that does not have the genetics to truly sprint. Different lines of horses have different muscle compositions. The more fast-twitch muscle fibers a horse has, the better chance it has of running at top speed for short distances. Slow-twitch muscle fibers give the horse more stamina but less speed. Thoroughbred horses, for one, have a different type of muscle fiber than a foundation-bred Quarter Horse. Slow-twitch Type 1 horses work off of aerobic metabolism, and that's how they produce their energy. They are a highly oxidative type of horse, whereas in

other breeds you will have Type 2 fast-twitch fibers, which are further divided into fast-twitch types 2A and 2B, and are low-oxidative fibers. Low oxidative fibers are used for speed and strength. Running backs on top football teams have fast twitch fibers. Long distance runners have slow twitch muscle fibers.

Another way breeding can affect the final product is with a dose of hybrid vigor. Hybrid vigor comes from outcrosses. The maximum outcross comes from breeding to a completely differ-

ent genetic line. In flat racing Quarter Horses, this may be breeding a sprinting Thoroughbred stallion to a mare that is extremely fast out of the starting gates. For barrel horses that run an even shorter distance than flat racers, a Thoroughbred parent may add too much of a percentage of slow twitch fibers. However, a level of hybrid vigor can still be obtained by breeding to a stallion or mare that was a successful flat racer to a successful barrel racer, if their genetic lines are not duplicated in either pedigree.

Along with extra speed, the hybrid vigor also tends to produce an overall healthier and sounder horse. The reason for this is that line breeding, while it “fixes” the good traits of a superior horse into the genetic line, it also fixes the negative traits of that same line. So you have to be careful when doing any line breeding. The end result can be very good or not so good. Knowing outcrosses are essential for the health and wellbeing of a line of horses is one thing; knowing which horses to cross is something else.

Your first outcross is your best hybrid-vigor foal and is going to be a superior performer in most cases, but they don’t breed as true since they are “crossbred.” That is the general rule, but there will be a small percentage that will pass on their genetic makeup, so that a percent-

age of that second and third generation will have and pass on their performance ability. That is when you get a superior breeding animal. A good and responsible breeder is looking down the road for soundness—that mare or stallion is going to be producing generations of babies for the racetrack or the arena, and they have to be able to perform for the long haul. It can take years and years of dedicated breeding to even produce one superior animal as a broodmare or stallion, and it can take four to 12 years to see how their get produce and whether they are consistent. Not only that, but if you don’t have a good cross you can very well end up back at the drawing board.

Clearly, this is a simplistic explanation of a very complicated process and it’s even possible that while trying to produce a speedier Quarter Horse, you could end up slowing him down through the breeding process. It’s imperative to know the full ins and outs of breeding before producing more horses.

There is some science to it. When you are looking to produce the whole package, start with a pedigree of fast horses, not just one generation that produced a superstar. What you want is a long line of generation after generation producing speed horses.

Correct Conformation

Now that we have the pedigree and breeding aspect of the sprinter conditioning program in place, let’s address another cornerstone of the topic, and that is conformation. If you are looking to have soundness in your equine athlete, you have to look for great conformation, bone makeup, strength, size of their feet—the whole body phenotype that can not only produce speed, but a horse in which the body stays together.

Good conformation is required for any discipline, but even more so when extreme speed and agility is required to win at the highest levels. A well-conformed sprinter not only has straight and correct legs with big, strong feet, but it is well balanced with a short back and a long underline. A sprinter needs powerful hindquarters to propel its forward motion and a strong, well-sloped shoulder matching the rest of its body. The horse must be well balanced.

Good conformation helps the joints and tendons last longer and gives the horse a better chance to have a career without injuries. Good conformation is a result of good genetics, and to some extent, good nutrition. It is also helped by early and good farrier care and attention to the young horse’s legs as it grows in the early months.

Nutrition Know-How

Once our well-bred and excellently conformed prospect is ready to train, we need to feed it correctly so it will get the maximum benefit from the last stage of conditioning a sprinter, which is the work itself. Probably the most significant contributing factor to injury, besides accidents, is fatigue. When horses become fatigued, they lose balance and their joints do not function like they’re supposed to, which makes the horse more prone to hyper-extended joints.

The reason a horse’s susceptibility to injury is increased, more than anything else, is fatigue. Fatigue shows itself in a variety of ways. You may hear a trainer or rider talk about “running out of horse” or a horse “running out of air.” And while a horse that is unfit or has a physical



Many of the horses that seem to “run out of gas” have simply run out of the fuel it takes to keep the anaerobic pathways flowing.

impairment may not be able to breathe adequately, many fatigued horses are still breathing well, making it difficult to pinpoint the cause of the trouble. In a barrel horse or racing Quarter Horse, you might see fatigue as the horse that leads for the first 300 yards, but just can't hang on for the last 50 yards and fades quickly to finish back in the pack, or the horse that is lightning fast around the first two barrels but fizzles when turning the third barrel for home.

Unlike the physical tiredness of an out-of-shape horse, the fatigue of a fit, healthy horse is probably metabolic fatigue. The amount of energy required for the horse's muscle to keep contracting and for the horse to keep performing at that high level becomes greater than the horse's ability to produce that energy. It's not that the horse is physically tired, but metabolically his body has simply run out of fuel.

The dietary solution, then, is to delay the onset of fatigue by ensuring the horse has an adequate fuel source to perform

his job. Feeding your horse to delay the onset of fatigue and therefore reduce injuries requires knowledge of how horses metabolize feed to produce energy.

As we touched on in the first few paragraphs, there are two basic kinds of metabolic energy production, aerobic and anaerobic. Aerobic means "requiring oxygen." The aerobic system is the horse's primary means of energy when he is doing slow work, such as a pleasure horse. At slower speeds, the horse is able to take in enough oxygen to burn fat as a fuel source.

When the aerobic system is being utilized, the energy in the muscle is produced by the change of oxygen in the air to carbon dioxide and water. It is dependent on a quantity of oxygen consumption. The horse has to be going slow enough to take in sufficient air and get sufficient oxygen down through the oxygen transport system, which is all the way through the nose, down through the trachea, down through the lungs, into the

blood stream, circulated around the blood stream and out into the muscles. That all takes time. As long as the rate of work the horse is doing doesn't exceed the capacity of the horse to transfer oxygen from the air down to the muscle, then they can work at that rate indefinitely. But it's a very slow source of energy production.

The second system is the anaerobic system. Anaerobic means "an absence of oxygen." Barrel horses and racing American Quarter Horses rely on short, fast bursts of speed to perform. The aerobic energy system simply doesn't have time to work. The anaerobic system is a much faster way of supplying energy to the muscles. The Quarter Horse racehorse is totally anaerobic. When a horse works as fast as he can work for 25 seconds or less, it's all over with before the oxygen can get from the nose to the muscle. So to have the extra energy they need to go running down the racetrack or around a barrel pattern, there has to be an anaerobic fuel supply, otherwise they can't do their job.

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The anaerobic energy system is totally dependent on carbohydrate energy, or energy from sugars, that can be metabolized down to a certain point without oxygen and produce energy. When you load a horse in the gates or have it ready to run into the arena, suddenly the horse gets an adrenaline surge and it knows it is about to perform at its maximum output. At this point, the horse's energy requirement is much greater than what it can produce aerobically, so it has to shift to the anaerobic energy system.

The carbohydrate used by the anaerobic system comes from carbohydrates in the horse's diet. It circulates in the horse's blood stream as blood glucose and is stored in the horse's liver and muscles as muscle glycogen. It is this stored muscle glycogen that makes all the difference in how quickly a horse can respond with bursts of energy. If a barrel horse or racehorse has a source of glycogen stored in the muscle, then it can produce the energy needed for a lot of quick action for several seconds, which is what it takes to run a barrel pattern or a sprint race up to 440 yards. Likewise, if a horse does not have enough stored muscle glycogen to draw from, it lacks the muscle energy needed to respond with speed and precision.

When a racehorse gets to the second half of the race, if there's any glycogen left in that muscle, it can still go. But if there's not any glycogen left in the muscle, it has to quit no matter how bad it wants to keep going or regardless of how hard you encourage the horse. When the stored muscle glycogen is gone, horses cannot continue in the anaerobic metabolism that's necessary to produce the energy to continue at a high level of performance. Immediate fatigue and the possible injuries that go with fatigue are the results of running out of fuel.

There is an easy way to increase your horse's stores of muscle glycogen, and that is through diet. The first and most effective way to increase the muscle glycogen is to feed a carbohydrate-rich diet. It's like putting fuel in the gas tank of your truck. If you've got more fuel in the tank, the truck can go further. It's the same way with muscle glycogen storage. There's

Genetics, nutrition and fitness level are key factors in a successful sprint-conditioning program. Selecting genetics for the right muscle composition can help optimize your performance horse program.



always a little glycogen in the muscle, regardless of what you feed the horse. But if you feed it the right kind of diet, you can increase the amount of glycogen it stores in the muscle, thus you can increase the amount of time it can do anaerobic work. High-performance horses need to have some grain in their diet. It takes a lot of carbohydrates in the diet to develop that anaerobic fuel system.

By increasing the amount of time a horse can do anaerobic work, you are delaying the onset of fatigue. And if you can delay or prevent fatigue, you

will reduce injuries. The second way to increase muscle glycogen is by adding fat to the diet. While added fat doesn't directly increase muscle glycogen, it gives the horse more fuel for aerobic exercise so it doesn't have to tap into its carbohydrate stores for energy.

This is important, because most high-performance events balance aerobic and anaerobic exercise. When a horse is warming up before a race, it is using its aerobic system and metabolizing fatty acids. When it is racing, it's using its anaerobic system and metabolizing carbohydrates. By adding fat to the diet, you can increase the energy density of the diet and provide an energy source the horse can use when warming up, and certainly at times when its resting. The horse doesn't have to use up its carbohydrate reserves for aerobic metabolism. It allows the carbohydrate reserves to be packed into the muscle and liver so it can be called on when they have to do that really hard anaerobic work.

There are several feed companies that offer high-carbohydrate, high-fat diets that are close to ideal for performance horses. Look for a feed that is grain-based, because grain provides the high carbohydrates a performance horse needs. The feed should have a minimum fat content of 8 percent, and preferably closer to 10 percent. Avoid high-fiber, high-fat feeds, as they won't provide the carbohydrates

DR. STEVE FISCH AND DR. JENNIFER GODMAN,

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your horse needs to build its muscle glycogen stores.

In addition to grain, a horse also needs no less than one percent of its body weight every day in hay. The type of hay you feed isn't nearly as important as the quality, though. Grass hay works as well as legume hay if the quality is good and the hay is highly digestible.

Another good strategy is adding electrolytes (salt) to a horse's diet to keep its metabolic system functioning at peak levels. A horse in high-performance training can need 2-3 ounces of salt per day to replace what it loses in sweat. You can add an ounce of table salt (NaCl) and an ounce of Lite salt (KCL) each day and you will replace the big three electrolytes your horse sweats out much better than if you fed a sugar-based electrolyte supplement.

Electrolyte imbalances cause the body-fluid control mechanism to get unbalanced. Then, the metabolic system gets out of balance and slows down. The lack of electrolyte balance decreases meta-

bolic efficiency, which can lead to fatigue. Electrolyte imbalances, muscle glycogen depletion and physical impairments that decrease oxygen intake all cause fatigue. Overworking or working past a horse's fitness level also causes fatigue. The biggest contributing factor—other than accidents—to injuries in barrel horses and racing Quarter Horses is fatigue. Make sure you control all the anti-fatigue factors you can and start by filling your horse's tank with fuel that allows it to work at maximum speed using anaerobic metabolism.

Physical Training

Now that we have your excellent conformation sprinting prospect bred and fed, it's time to start the actual physical work of your horse's sprint training program. For high-powered work such as sprint racing, as previously stated, a horse will have to rely primarily on anaerobic energy to get the job done. Therefore, you must train the anaerobic system to have the horse ready for a successful sprint around

the barrel pattern or down the track. Generally, at a heart rate of around 150 beats, horses will switch over to anaerobic energy consumption.

Sprinting, or "breezing," is the type of work that improves a horse's anaerobic capacity. This type of speed work will also help strengthen and remodel bones. Just galloping, without occasional pushes for speed, has been shown to simply mimic a horse at pasture.

There are two ways to work on speed conditioning. You can increase the speed for a short distance and then gradually add distance, or you can work the horse up to his full distance and then gradually push for speed. A horse should not be pushed to top speed during all its workouts—in fact, most conditioning should be done at 70 to 80 percent of the maximum speed expected. Equally important, the horse should not be pushed to sprint its full expected race distance all at once.

Many trainers stick to sprinting once or twice a week. The amount of rest

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between speed works will depend on the horse and its fitness level. You can “over train” your horse. Muscles, joints and bones need time to repair from the minute muscle tears and bone micro fractures that happen at top speed, but if given

the correct amount of rest between these workouts, training actually makes the muscles, bones and tendons stronger. The horse needs to be evaluated frequently as to heart rate, which will rise to 200 or 250 beats per minute when galloping, for

respiratory distress and any sign of muscle or bone soreness.

Your horse may build up to sprinting the full distance in total but will be doing it in three or four sets of shorter sprints instead of all at once. The exact ratio of speed work to rest to long, slow distance work will need to be customized to your horse and the type of race it will be running. Since barrel horses and flat racing Quarter Horses race short distances, the ratio will lean more toward the speed works versus long, slow distance training. For a horse that is fit and knows its job, speed work every 10 to 14 days is probably sufficient and will keep the horse sounder longer.

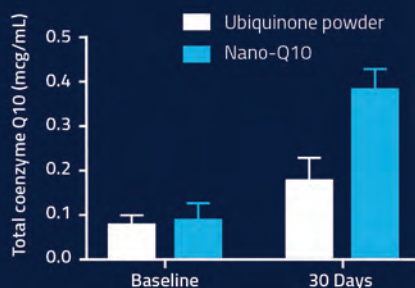
No successful training regimen is a one-size-fits-all program, because all horses are different. Hopefully this article gives you some science to help fine-tune your sprint program.

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