

FEEDING TO PREVENT INJURIES

Dr. Gary Potter explains the science behind using nutrition to prevent injuries in racehorses.

by Stacy Pigott

Throughout the years, equine nutrition has become more specialized and advanced to the point that it's nearly impossible to walk into a feed store without being bombarded by advertisements for the latest and greatest feed. This feed promises to reduce your horse's risk of colic; that feed will keep a senior horse going; and the other feed says it can add weight and bulk to those hard keepers. But what if there was a way to feed your horses to prevent injury? Would you be interested?

As it turns out, Dr. Gary Potter, Professor Emeritus of Equine Science at Texas A&M University, has spent years researching that exact topic. His research has proven that there *is* a scientifically-proven nutritional management program that can help prevent injury in high-performance equine athletes, including racehorses.

To understand how a nutritional program can help prevent physical injuries, it's important to understand why most injuries occur in the first place.

FATIGUE

"Probably the most significant contributing factor to injury—aside from accidents—is fatigue," said Dr. Potter. "When those horses start to get fatigued and can't hold themselves upright and make their joints function like they're supposed to, they're more prone to hyper-extended joints. The thing that increases a horse's susceptibility to injury more than anything else is fatigue."



Metabolic fatigue can cause a horse to finish a race poorly for no apparent reason.

Fatigue shows itself in a variety of ways. Anecdotally, you may hear a trainer or jockey talk about a horse "running out of air." And while a horse that is unfit or has a physical impairment may not be able to breathe adequately, many fatigued horses are still breathing well, making it difficult for horsemen to pinpoint the cause of the trouble. In a racehorse, 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.

Unlike the physical tiredness of an out-of-shape horse, the fatigue of a fit, healthy horse

is metabolic fatigue, Potter says. 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; 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 a basic knowledge of how horses metabolize feed to produce energy.

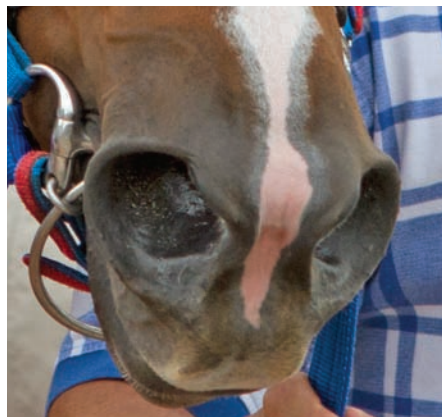


When a horse becomes fatigued, his muscles lack the energy to properly maintain a correct stride and hoof placement, which can lead to joint and leg injuries.

AEROBIC VS. ANAEROBIC ENERGY PRODUCTION

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 from the reduction of atmospheric oxygen to carbon dioxide and water. It is quantitatively



Aerobic energy production, where the oxygen a horse breathes is metabolized into energy, is a slow source of energy production—too slow for the racing Quarter Horse.

dependent on oxygen consumption,” said Potter. “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 “relating to an absence of oxygen.” The racing Quarter Horse relies 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 the extra energy that they have to have to go flying down that track, they’ve got to have an anaerobic fuel supply or they can’t do that.

“The anaerobic energy system is totally dependent on carbohydrate energy, or what you might call sugar energy, that can be metabolized down to a certain point *without oxygen* and produce energy,” Potter explained.

THE PROTEIN MYTH

Many people mistakenly believe performance horses need a high-protein diet. What they actually need is a diet that meets, but doesn’t exceed, their protein requirements.

“Protein is not where it’s at,” said Potter. “When you over-feed protein, the horse has to get rid of all of that excess nitrogen, which generates heat and is counterproductive to what you are trying to accomplish.”

Not only does feeding excessive protein cause metabolic stress for the horse, it is also unnecessarily expensive for the owner/trainer. A balanced diet that meets your horse’s protein requirements is safer for your horse and more economical for you.

“When you load a horse in the gates, all the sudden the horse gets an adrenaline surge and he knows he’s got to get busy. Now, his energy requirement is so much greater than what he can produce aerobically. He has to shift to his anaerobic energy system.”

The “sugar energy” 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 racehorse has a source of glycogen stored in the muscle, then he can produce that energy needed for really quick action, and a lot of it, for several seconds, which is all you need,” Potter says.

Likewise, if a horse does not have enough stored muscle glycogen to draw from, he will lack 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, he can still go. But if there’s not any

glycogen left in the muscle, he's done," Potter stated. "It doesn't make any difference how bad he wants to, it doesn't make any difference how hard you whip him, it doesn't make any difference what you do. When they deplete that muscle glycogen store, they cannot shift to that anaerobic metabolism that's necessary to produce the energy to continue at a high level of performance."

The effect on the horse is simple and immediate—fatigue.

INCREASING MUSCLE GLYCOGEN THROUGH DIET

Luckily, 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 a tank. If you've got a little bit of fuel in your tank the car can only run so far. If you've got more fuel in the tank, the car can go farther. It's the same way with the muscle glycogen storage," Potter explained. "There's always a little glycogen in the muscle, regardless of what you feed the horse. But if you feed him the right kind of diet, you can increase the amount of glycogen he stores in the muscle, thus you can increase the amount of time he can do anaerobic work. High-performance horses have 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 the 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 he doesn't have to tap into his carbohydrates 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, he is using his aerobic system and metabolizing fatty acids. When he is racing, he's using his 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 that the horse can use when he's warming up, and certainly at times when he's resting. He doesn't have to use up his carbohydrate reserves for that kind of energy metabolism," Potter continued. "It allows the carbohydrate reserves to be packed into the muscle and liver so that 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 (grain provides the high carbohydrates you need) with a minimum fat content of 8% and preferably closer to 10%. Avoid high-fiber, high-fat feeds, as they won't provide the carbohydrates your horse needs to build his 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 can be as effective as legume hay if the quality is good and the hay is highly digestible.

Finally, Potter recommends adding electrolytes (salt) to a horse's diet to keep his metabolic system functioning at peak levels. A horse in high performance training can need 2-3 ounces of salt per day to replace what he loses in sweat.

"If the electrolyte imbalance gets messed up, then the body fluid control mechanism gets messed up, and then the metabolic system gets out of whack and slows down. It'll basically make them metabolically inefficient, and it can lead to fatigue, for sure," Potter said.

"If a horse gets an electrolyte imbalance, he'll get fatigued; if he gets muscle glycogen depleted, he'll get fatigued; if he has a physical impairment and can't breathe well, he'll get fatigued; and, of course, if he's overworked or worked further than he can tolerate, obviously he's going to get fatigued. And the biggest contributing factor—other than accidents—to injuries in the performance horse is fatigue."

About the expert: Dr. Gary D Potter is Professor Emeritus at Texas A&M University where he spent 35 years conducting equine research—focusing on nutritional support for the equine athlete for most of that time. He now lives in Bentonville, Arkansas, where he owns and manages Potter Enterprises, which is primarily an equine consulting business. He provides research based, technical services and advice for the horse industry and feed industry. He can be reached at gdpotter@myalpha1.com (S)

SPEED CRAZY

"The problem that you run into with a racing Quarter Horse is if you get one of those horses really fit with a lot of stamina, with a lot of muscle glycogen stored in there, they can get sky high. Basically they get what the trainers call speed crazy," said Dr. Potter. "You can deal with that if you've got them broke and you've got the right kind of rider and the right training program. You can deal with that by galloping the edge off of them. But they will get sky high. There's a conflict between getting horses really, really fueled up and the temperament that results. Some people just can't handle it; you have to be a good hand to deal with it. You have to work as feverishly as you can as a trainer to keep the horses mentally stable while you're trying to build up that stamina. It can be done, it's just something you have to learn how to do."

