

## PSSM and a Quarter Horse Named Doc

by Claire C. Cox-Wilson



Did you ever wonder how you could just overlook little signs and symptoms for years? Then, suddenly one event makes you sit up and take notice. That is exactly what happened to me.

One morning in November of last year, my husband David noticed Doc our QH gelding lying down in the back pasture. We watched him get up, take a couple of steps, turn around and lie down again. The other three horses were peacefully grazing close by. David turned to me and said, "He's not right--- he's just not right". On the off chance he had an upset stomach, I grabbed some probiotic. We walked down to the pasture together, our handsome buckskin didn't stir. When Doc finally did get up, David observed that unlike our other horses Doc never shakes when he gets up. He was right...why had I never noticed? I did a quick physical assessment. Doc had good gut sounds, respiratory and heart rates were within normal limits. He was not sweating. Colic didn't seem to be the problem, but I gave him the probiotic anyway. It couldn't hurt. I tried to rub and scratch his withers, as he usually enjoys a good scratch and rub. Surprisingly, he wasn't interested. I watched him as he walked away. Theoretically, he wasn't lame, but I noticed his hindquarters seemed extremely stiff. I approached him again. Doc made it very clear that he did not want to be touched.

His golden eyes were sad and clearly told me--- just leave me alone. I recalled our massage therapist's comments about Doc's massive build and unusually hard muscles. Our trimmer had also commented on his musculature on several occasions. Was Doc experiencing severe muscle pain? On the other hand, did Doc's legs hurt? Worse yet, had Doc's navicular symptoms returned? So many things could be wrong with him and I wasn't quite sure what to think. It was then that I took on the mission of finding the root of Doc's discomfort. Because as David had said.... Doc just wasn't right.

Doc was obviously uncomfortable and finding the source of his discomfort was not going to be easy. According to our massage therapist, Doc had chronic muscle pain and soreness in his hindquarters and shoulders. I knew from our experience with navicular syndrome/disease that hoof and leg pain can cause all kinds of compensatory soreness and pain. I contacted our veterinarian and scheduled her to come out and run some blood work and perform a thorough lameness exam. She watched me longe Doc and agreed that his hindquarters were very stiff. She started out with flexion tests that showed definite problems in Doc's fetlocks. The nerve blocks further confirmed discomfort in the fetlock region. We took X-rays. Doc had mild fetlock arthritis and pastern ringbone in his right front and moderate to severe arthritis and pastern ringbone in his left front. We decided to try the Hyaluronic Acid (HA) & methylprednisone joint injections and see if these would offer Doc some relief.

Within three days of the joint injections, I saw a marked improvement in Doc's front-end movement, but there was still something wrong with his hindquarters. It was becoming clear to me that his hind-end stiffness was not entirely a compensatory mechanism for front leg pain. Many of the symptoms of PSSM/EPSM can also be a symptom of certain mineral deficiencies; magnesium comes to mind, as it can cause weakness and cramping. We have our hay analyzed and then mineral balanced by Dr. Eleanor Kellon, so we knew a mineral imbalance was not the case with Doc. Both insulin resistance and hypothyroidism cause exercise intolerance and low functioning thyroid can also cause tying up; therefore, a thyroid panel, an insulin and glucose should also be drawn when dealing with muscle pain and cramping. Although Doc's muscle enzymes came back slightly elevated, our veterinarian placed little value on them as a diagnosis for PSSM as many conditions can cause a rise in muscle enzymes. We had ruled out a mineral deficiency, thyroid problems and his joint pain was under control. The only accurate test for PSSM/ EPSM is a muscle biopsy. It was clear that a muscle biopsy was the next step.

The muscle biopsy is a relatively simple procedure. Fortunately, we didn't have to add to Doc's stress level with a trip to the veterinary clinic. The biopsy was done right here at home. Doc was administered a mild sedative and the area was infiltrated with a local anesthetic. The whole procedure including preparation time probably took less than thirty minutes. Our veterinarian fedexed the muscle sample to Dr. Stephanie Valberg at the University of Minnesota.

While his biopsy site healed and we waited for the results of the muscle biopsy, I started hand-walking Doc. Unfortunately; to complicate matters I discovered Doc was having hoof issues. To make a long story short, through some miss-communication our trimmer had been over-trimming Doc. His soles were very thin and extremely tender. A friend recommended hoofwings by HorseSneaker Hoofwear, located right here in Arizona (<http://www.horsesneaker.com/>). In addition, I used trax pads as inserts.



## Doc in his Hoofwings

I couldn't hand walk Doc much less longe him without the boots. He was very uncomfortable without his hoofwings. It took approximately two months for his soles to heal. In the midst of all this, we received the results of his muscle biopsy. Doc had moderate PSSM.

## What is PSSM?

Polysaccharide Storage Myopathy (PSSM) is a condition in horses where there is abnormal glycogen storage occurring in muscles resulting in the accumulation of excessive amounts of glycogen and an unusable polysaccharide. The University of Minnesota's Diagnostic Neuromuscular Lab website describes PSSM as a muscle disease in horses with Quarter Horse bloodlines such as Quarter Horses, American Paint Horses and Appaloosas. Dr. Eleanor Kellon of Equine Nutritional Solutions defines PSSM as a problem with energy generation within the muscle cell that is characterized by the muscle storing large amounts of glycogen (storage form of glucose) and an abnormal form of carbohydrate as well. Deposits of fat in the muscle are lower than normal. Studies have found that these muscles metabolize carbohydrate normally so the high levels of carbohydrate storage don't occur because of a problem with burning them. Researchers still haven't found what the metabolic problem inside PSSM muscle cells is, why they preferentially store large carbohydrate reserves, or why supplying additional fat helps. It may be that the extra fat "trains" the muscle to use more fat than it is inclined to do. This is beneficial because ounce per ounce fat yields more energy for the cell.

Equine Polysaccharide Storage Myopathy (EPSM) is another form of PSSM that occurs in Draft, Draft crossbreds and warmbloods. The book *Draft Horses-An Owner's Manual* by Dr. Beth Valentine covers this condition.

## Classic Symptoms of PSSM

Horses with PSSM typically have signs of tying-up. Most commonly these signs of muscle stiffness, sweating and reluctance to move are first noticed in horses when they are put into training or after a lay-up period when they receive little active turn-out. Episodes usually begin after very light exercise such as 10-20 min of walking and trotting. During an episode horses seem lazy, have a shifting lameness, tense up their abdomen, and develop tremors in their flank area. When horses stop moving they often stretch out as if to urinate. They are painful, stiff, sweat profusely and have firm hard muscles, particularly over their hindquarters. Some horses will show signs of pawing and rolling immediately after exercise. Most horses with PSSM have a history of numerous episodes of muscle stiffness beginning with the commencement of training; however, mildly affected horses may have only one or two episodes/year.

Per Dr. Karen J. Wolfsheimer's article on PSSM, depending on the severity of involvement, symptoms can include any of the following:

- all around stiffness
- difficulty rising
- reluctance to "move out"
- tires easily
- saddle issues (sore back)
- bucking
- resistance to holding up the hind feet for shoeing or cleaning
- subtle lameness episodes

- abnormal gaits
- cranky attitude
- muscle tremors or sensitivity
- kicking at flies that aren't there (muscle cramps)
- excessive tail swishing (muscle pain)
- looking at belly or flanks as if colicky (muscle pain)
- having a preference for rubbing or rolling a lot, or in some cases the opposite with resistance to brushing/grooming, especially over the back and rump
- affected horses may show a stiff, tense gait with difficulty getting that nice relaxed rhythmic swing that is so desirable in the dressage horse or any other athletic, sport horse
- symptoms of "shivers" where there is an abnormal hind leg action and muscle quivering has been described in draft breeds

If left unmanaged, over time, the muscles can atrophy and the horse can show severe muscle wasting.

## Doc's Symptoms

Doc has always displayed symptoms of PSSM but we never tied it all together.

While trying to decide whether to do a muscle biopsy on Doc, I made a list of his symptoms.

- cranky when asked to canter both under saddle and on a line. When he was young he would buck, as he matured he would swish his tail angrily
- extremely hard muscles even when out of shape
- backs up very slowly and reluctantly
- seems uncomfortable when asked to pick up his back legs
- difficulty picking up his right lead
- unexplained episodes of back soreness
- stiff, choppy gaits, he was never relaxed and rhythmical
- tripping, which we attributed entirely to his Navicular Disease/Syndrome
- quivering chest muscles, especially when waiting for his feed
- at times Doc did not want to be groomed, acting as if he was going to bite
- a history of tying-up

Looking back, I suspect that this may be exactly why his first owners sold him. I think he started tying-up on them and rather than deal with it...they sold him. This horse was a beautiful heeler; very well trained (I loved to watch him come out of box because the raw power would make the ground tremble). When David bought him he was the envy of the ropers at our boarding stable but David never really had the time to learn to rope so he became a pleasure horse. We did a little team penning on him but mostly trail rides. We never worked him very hard. In our younger days, we warmed him up little in the round pen and just rode around. I still remember the first time he tied up on me. That day he had so much energy that I let him run it off in the round pen...when we finished he was dripping with sweat. So, to cool him off I decided to saddle him and go for a walk around the block, but before we got back to the barn he stopped and wouldn't move. I got off and saw that his hind end muscles were rock hard and quivering---I didn't understand what I was seeing. All I knew was that Doc was in pain. Slowly, and with frequent stops I managed to lead him back to the barn. I unsaddled him and instinctively threw a sheet over him. Someone mentioned the words "tying up" and one of my friends produced some bute paste. This was my first experience with this condition. It simply broke my heart to see Doc in such pain --- I put my arms around his neck and cried.

In the 1990's tying up was linked to Monday Morning Disease/ Azoturia. I did some research and started him

on Vitamin E & Selenium. I was also very careful not to over work him. In those days, they attributed tying-up to continuing the grain ration on days of rest, hence the name Monday Morning Disease. However, that was not the issue here, as we have never grained our horses except for the handful of oats for psyllium palatability.



Doc during a Cowboy Dressage class in May 2001...note the swishing tail.

## Managing Doc's PSSM

As soon as I had started to suspect PSSM, I started reading about the management of this disease. Management of PSSM mainly consists of a low carbohydrate- high fat diet, as well as regular exercise. Bottom line... we needed to train Doc's muscles to use fat for energy instead of carbohydrates.

The recommendation was one pound of fat per 1000 lbs of horse per day, which if using straight oil would mean two cups of oil for a 1000 lb horse. The consensus was that any type of oil was acceptable. There are some high fat feeds available but I had some concerns about high iron content and the preservatives needed to keep these feeds from going rancid. There were so many things to consider and I wanted to play it as safe as I could. I really became concerned when I talked to two horse owners who had followed the oil recommendations, with a diagnosis based totally on symptoms I might add. Both of these horses had laminitis and were displaying symptoms of insulin resistance. As it turned out one horse did not even have PSSM but a mineral imbalance.....I was glad we had decided to get a muscle biopsy. I felt very strongly that Doc had been through enough; I was not willing to take the risk of him coming down with laminitis and/or

insulin resistance. The more I read the more concerned I became. This fat and carbohydrate stuff was way over my head, what I needed was an expert in equine nutrition, someone I could trust.

I sent Dr. Eleanor Kellon an emotional email asking for her guidance with Doc's new diet...who better to guide us through this diet change but an expert on equine nutrition?

"We need a game plan here, with goals for Doc rather than goals for fat intake," Dr. Kellon said in her response to me. I felt better already. Dr. Kellon was looking at Doc as an individual.

Adding fat to a horse's diet seems simple enough, however a horse's natural diet of fresh grass is very low in fat, and the only actual "requirement" they have is for fatty acids they cannot manufacture themselves, these are the omega-3 and omega-6 fatty acids. These are referred to as the Essential Fatty Acids (EFAs). Dr. Kellon explained that if we were going to supplement fat, we might as well do it in as healthful a way as possible and make sure we were feeding Doc "good" fats.

Stabilized fats are oils you buy on a store shelf, and oils added to feeds, weight gain products, added rice brans are all stabilized and have the EFAs destroyed. Stabilization can also change the structure of fats, producing hydrogenated or partially hydrogenated forms, and trans fats. Stabilized/trans fats have been recognized as a health risk in Europe for decades (including in relation to heart disease, diabetes/IR), and the FDA is finally getting around to requiring label information on human foods. These fats are not in a natural form and Dr. Kellon did not recommend them for Doc. I call these "bad" fats.

Dr. Kellon suggested either cocosoya or straight coconut oil. Coconut oil and cocosoya (a blend of coconut and soy oils) are highly palatable and high in medium chain triglycerides (MCTs), a form of saturated fat. This isn't the same as other forms of saturated fat that people are instructed to avoid (i.e. palm oil, meats). MCTs are different because they can be utilized directly as energy sources by the cells---at least the cells of other mammals. Unfortunately, no equine specific data is available on this subject. This last comment did not deter me. In January 2000, we had plunged into the barefoot world to cure Doc's navicular against the advice of friends, vets and our farrier. It had made perfect sense to me. We have never regretted pulling those egg bar shoes. Dr. Kellon's diet for Doc also made perfect sense to me. We would balance the high omega-6 fatty acids in these oils with ground flax; an excellent source of omega-3s. I was starting to feel better about this high fat diet.

However, that was not the entire plan. Dr. Kellon had me start Doc on L-Carnitine. L-Carnitine is made in the body from the amino acids lysine and methionine, and is needed to release energy from fat. It transports fatty acids into mitochondria, the powerhouses of cells, "furnaces" where these fuels are burned. With the exception of medium chain triglycerides such as those found in high concentration in coconut oil, all fatty acids require L-Carnitine to carry them into the mitochondria. The idea was to give Doc both a supply of the MCTs and supplemental L-Carnitine to help him utilize other fatty acids so that we could achieve the desired results with a minimal amount of actual oil.

I ordered the L-Carnitine and started Doc on an ounce of Cocosoya oil twice a day. I was up to 4 ounces of Cocosoya oil a day when the L-Carnitine arrived.

Within three days of starting the L-Carnitine I could feel a difference in Doc's muscles...they were actually relaxed. That night David and I went around feeling all our other horses' buttocks, we giggled, hoping our neighbors weren't peeking out their windows at us. Surely, they would have thought we had lost our minds. However, this was scientific research and we needed a basis of comparison. David confirmed my thoughts. I wasn't imagining it, Doc's muscles were just as relaxed as our other three horses. Elatedly, I sent Dr. Kellon an email and made sure she knew that David had agreed with my findings. She informed me that it was indeed possible to see improvement so soon. David and I were ecstatic. We didn't expect to see results within

three days.

Today, Doc's daily diet consists of bermuda hay (anywhere between 10 to 20 pounds depending on the condition of our pastures) , about ½ pound of rinsed and soaked beet pulp, a pound and a half of alfalfa/bermuda pellets. He also gets 2000 IU of Vitamin E, a cup of stabilized flax, 1-2 ounces of iodized salt, and his glucosamine preparation. Even though we have a custom mineral mix (balanced to our bermuda hay) which includes magnesium, Dr. Kellon put Doc on extra magnesium oxide as well. Doc's PSSM symptoms are totally controlled with 3 ounces of oil a day. I use a combination of straight coconut oil and cocosoya oil, and of course his L-Carnitine.

For exercise, he is either longed (for 20 minutes) or ridden five times a week. His gaits and transitions are smoother than ever before and he picks up both leads equally well and consistently. The big bonus is that he is only grumpy when the pastures are closed off because of irrigation.

Not too long ago I was talking to my neighbor, not a horse owner but definitely a nice person since he allows our horses to have 24/7 access to his back pasture. Doc who sometimes prefers human company to his equine friends had joined our discussion. He looked intelligently and appropriately at each of us as we spoke. We discussed the usual topics in our neighborhood, the gophers that chewed up the roots to my orange tree and the fact that our irrigation water always seems to arrive at two or three in the morning and of course, the inevitable advent of our Arizona summer. I propped my foot on the bottom rail of our fence as we talked. Quick as a wink and slicker than you know what, Doc reached down and untied my shoelace. "How did you teach him to do that?" My neighbor asked, laughing. I assured him that Doc didn't need me to teach him any tricks. I gave Doc a stern look and bent over to tie my shoelace. Doc promptly pulled the scrunchie out of my hair and my ponytail collapsed around my face. I looked up as Doc walked away with long, smooth strides, front and back-end...just the way a healthy horse should walk. He stopped, turned around, my red scrunchie still in his mouth and looked at me as if to say "Gotcha!"

I smiled at my neighbor and said, "Yep! That's my Doc."

### **A note on Eleanor Kellon, VMD:**

Eleanor Kellon (Equine Nutritional Solutions, Ephrata, Pennsylvania) is one of the few experts in the field of applications of nutraceuticals for horses. Due to her extensive experience in this new discipline, she is able to indicate potentials and limits of nutraceutical usage in horses. She is also an expert in the field of equine nutrition as well as matters concerning performance horses. Dr. Kellon is veterinary editor for the *Horse Journal* and *John Lyons Perfect Horse* magazines. She has written a number of books, including *The Older Horse*, *Equine Drugs and Vaccines*, *Equine Supplements and Nutraceuticals* and *Dr. Kellon's Guide to First Aid for Horses*. In March 2006, Dr. Kellon was a speaker at the Third European Equine Nutrition & Health Congress in Belgium. Her presentation focused on use of nutraceuticals in equine health and performance. Equine Cushings and Insulin Resistance are just two of her many areas of expertise. For more information on Dr. Kellon go to <http://www.drkellon.com/>

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06-01-06 Doc.....no worries now.