

March 2016

HYP P IN PERFORMANCE HORSES



Pictured above left is the famous halter stallion Impressive, pictured right is a cute paint doing dressage. My cute paint! As someone who specialized in English riding disciplines at an early age, I never thought I would need to know much about a World Champion halter stallion, but then an APHA registered yearling called Peppy came into my life. I am still learning about Impressive to this day. Although they look nothing alike they are related through Peppy's sire, Ima Classy Solis, who is a grandson to Impressive. Why does this lineage matter? Impressive carried a gene for a disease known as HYPP that he passed to all his many descendants, including my horse.

Sounds like devastating news on a performance horse doesn't it? It's been a journey that I would like to share with you in case you also have a horse of this lineage or know someone who does.

1. THE DISEASE:

What exactly are we talking about? When I bought my horse the breeders said he was tested for HYPP and the results were heterozygous (h/n). They assured me he had never had an attack in the 18 months he'd been alive and that he probably never would. At that time I had no idea what that meant or how it could effect his life as a performance horse. I don't think the breeders did either.

This disease is an inherited defect of the muscles in affected offspring. While it may seem unlikely that a horse suffering muscular disorders could ever be a high performance equine, it can be done. Peppy does it every day!

- A. Hyperkalemic Periodic Paralysis (HYPP)** – hyper means high or in excess, kalemic refers to the amount of potassium present in the bloodstream. Periodic paralysis is self explanatory.
- i. Impressive (#0767246) – AQHA Appendix stud born in 1968. Impressive was a proven champion in the early 1970’s winning all 31 of his classes. He achieved World Champion Open Aged Halter status with 48 halter points in 1974. With Championship status came many breeding contracts, unfortunately it wasn’t until the 1990’s that the disease and genetic link to Impressive came to light and even longer before research study results and testing were in place. Testing was not required by AQHA until Jan. 1st of 2007 at which time they also enacted a rule refusing registration to homozygous horses testing h/h. The Appaloosa and Palomino horse registries put similar rules in place that year, as well.
 - ii. The Genetics – HYPP is an autosomal dominant gene mutation, which means it is not gender linked, all offspring are affected and will pass the gene on to their offspring. Horses of the Impressive line that do not show symptoms still carry the gene and will pass it on. Basically, while not all offspring suffer visible illness, all offspring are “carriers”. It is not a result of “inbreeding,” it is a mutation. Unfortunately the progenitor of this mutation (Impressive) was not identified until after Championship status created a large generation of affected offspring. It is estimated that Impressive has more than 100,000 descendants and the number continues to grow. Testing is available from UC Davis Veterinary Genetics Laboratory. These tests look for a specific gene pair that can be homozygous, heterozygous, or normal. Results are express h/h, h/n, and n/n respectively. Horses testing homozygous h/h are most likely to experience the severe symptoms and are at highest risk of death early in life. The heterozygous horses testing h/n are more moderate and may not suffer visible attacks at all. Horses testing normal n/n are at no risk. As far as breeding goes the inheritance possibilities look like this.

Breeding Outcomes

N/H x N/H have 25% chance of producing normal offspring, 50% chance of producing heterozygous carriers and 25% chance of producing homozygote offspring			N/H x N/N have 50% chance of producing normal (NN) offspring and 50% chance of producing carriers (NH).		
	N	H		N	H
N	25% NN	25% NH	N	50% NN	50% NH
H	25% NH	25% HH			

Diagram from www.vgl.ucdavis.edu

- iii. *The Muscle Cells* – The Sodium Channel is responsible for triggering muscle contraction by allowing sodium molecules to pass through and react to potassium molecules. The mutation results in a channel that leaks or opens unpredictably in response to fluctuating levels of potassium in the blood stream. This leaking can cause uncontrolled muscle contractions or “tremors”, paralysis, collapse, and in severe cases death from suffocation or cardiac arrest.

B. THE SIGNS: Let’s talk about what we are going to see in these horses.

Peppy experienced muscle tremors that resembled shivering in his left shoulder one to two times a year. I didn’t realize that was considered an attack for the first 6yrs I owned him. I had heard rumors of horses collapsing in the show ring or having spasms throughout the major muscle groups of the body. This shivering seemed so mild compared to those stories, we certainly were not experiencing those difficulties. I mentally classified him as unaffected and didn’t give it another thought for several years.

However, I did experience the daily struggle of grooming and riding a horse in constant muscular discomfort. Yearly vaccinations had always been dangerous for the vet as Peppy hated them and would attack. These struggles were very real, (I address them in subsection ii). He did have symptoms, I just didn’t know what I was seeing. Then I switched vets in 2012 and casually mention to Dr. Brown that Peppy was HYPP h/n, but had never struggled with attacks. She raised an eyebrow and looked at me. Then the questions started. What did he eat? How was he at shows? What was my normal warmup and work routine? I had fallen dreadfully short of positioning him to reach his maximum levels of performance.

- i. *Obvious/Expected* - Muscle tremors, usually when under stress or after feedings (when blood levels are changing). These tremors can range from minimal “shivering” in the muscles of the shoulder to the horse giving the appearance of tying up with many muscle groups firm to the touch or twitching. In severe cases it can also look like colic or neurological illness due to collapse of the horse with seizure like symptoms. **Triggers:** Preparation for trailering, tacking up for the first work out on show grounds, change in boarding barn, change in pasture, hay, or grain, change in work load or turn out to stall ratio. **Performance Note:** if your horse has the majority of tremors on one side, (for example, Peppy always has his in his left shoulder,) that may also tend to be their weaker or stiff side. Bending, lateral work, and flying changes will be harder on that side.
- ii. *Subtle/Unexpected* – All HYPP horses fed a normal equine diet experience long term, low grade muscle pain and swelling due to inflammation. My horse was silently suffering. If your horse has “never” suffered a visible attack you may not know what is a symptom until you make the appropriate diet and life style changes. After about 3-6 weeks some quirky habits may start disappearing.

Here were some of Peppy's: grumpy with ears pinned in response to grooming, petting or other touch or pressure related activities (Parelli games were tough). He could sometimes developed hoof rings when the grass changed. He felt terrible at the beginning of every ride, very stiff and heavy, but would feel great by the end. He hated the vet vehemently, because injections hurt 10 times more when given in an inflamed muscle. Jumping was deemed by him to be unnecessary effort. Peppy still will voluntarily do stretches when required to stand in the crossties for long periods of time, a habit he developed to keep his muscles loose. **Performance note:** These horses tend to require longer warm ups with lots of bending exercises, lateral work, and transitions. They may really seem to "come to life" after 30 minutes.

2. THE MANAGMENT

Once the diagnosis of muscle pain was in place my vet and I turned our attention to eliminating any sources of potassium in his nutritional regimen. That was where the biggest changes were made. Thankfully, my dressage training had helped me put a very successful workout routine in place for Peppy. His turnout schedule was also very appropriate. We were able to simply continue those in a more well informed light. Dr. Brown ordered Acetylzolamide for us to have on hand if he did have an attack.

Here is a break down of the areas we evaluated and the changes we made.

- A. **Diet** – Eliminating nutritional triggers can be tricky. The goal is to have 0.6 - 1% total potassium concentration in their diet.
 - i. Feed - I changed Peppy off of all processed grains onto the Tri Washed rolled oats that TSC sells in 40lb bags. He is an easy keeper and only requires 3lbs a day, (1.5 lbs AM & PM). Feeding oats, corn, wheat mids, barley or a mix of these is safer than commercially processed pelleted feeds. You can feed small amounts multiple times a day if your horse needs more total volume to maintain weight. Feeding the molasses coated pellets and sweet feeds are the worst as molasses averages a 6% potassium content!
 - ii. Pasture – Dr. Brown recommended using a grazing muzzle in the spring and fall when things are really green. Bright green vegetation can indicate high nutrient content and hence above average mineral content. Following this helped reduce the hoof rings and occasional diarrhea he could experience during these changes in his pasture. It is also important that these horses be out as much as possible. Moving about at the leisurely walk of pasture grazing greatly reduces muscle stiffness. Peppy stays out 24/7. At shows he gets as much hand walking as possible.
 - iii. Hay - Peppy has only ever received grass hays, which was the one good thing we had going. I feed a locally grown mix of fescue and orchard grass. Legumes, like

alfalfa, could really be a problem since their mineral content is always much higher than grass hays. Beet pulp is another safe roughage alternative, as well.

- iv. Other – No trace mineral blocks in his fields, only the plain white salt blocks. We avoid electrolyte powders as they often contain potassium.

B. Work – Creating a work regimen that complements your low potassium diet is the finishing touch on bringing your HYPP horse to pique performance.

- i. Plan – I was blessed early in my work with Peppy to train under Cindy Sydnor, international dressage professional based in my home town of Snow Camp. Her guidance toward an appropriate work regimen was invaluable. Dressage is a progressive training of the horse toward gradually more demanding levels of work while maintaining mental relaxation and supple musculature. It was the perfect route for Peppy. While dressage does not have to be your discipline it's purpose needs to be. *Progressive training of the horse toward gradually more demanding levels of work while maintaining mental relaxation and supple musculature.* Talk with your trainer and vet to develop a conditioning chart or progress plan. Build up your horses stamina, strength, and flexibility slowly so as not to stress these potentially compromised muscles.
- ii. Warmup/Work – Your warm up should consist of at least 2-5 bending and lateral exercises. Start in the walk asking the horse to bend on circles, move sideways off your leg, etc. Move into the trot and canter doing the same sorts of exercises. Ask for transitions within each gait, longer steps, then shorter steps, then longer steps. You will feel your horse loosen up and become lighter and more responsive to your aids (it can take longer to get to this point in cold weather). Once you've worked all three gaits each direction that's when you can begin schooling whatever you plan to work on that day. Get to know your horse well enough that you do not push him to exhaustion ever. Quit while you are ahead.
- iii. Goals – The sky is the limit, aim as high you want in your discipline of choice. Peppy made it to 3rd level in dressage before I moved onto to training on other horses and began using him as a lesson horse for my students to learn on. He did both equally well. Keep your trainer and vet in on the discussion all along the way. Set smaller, more immediate goals, whose sum achievement will lead to the bigger goals. Be patient, it takes years to train a champion to the top. Your trainer and vet will help you set realistic goals for you and your horse.

C. Medication – While most HYPP horses can be managed very successfully with diet and turnout/work changes alone, there are medication options to consider with your vet.

- I. What – Acetylzolimide: A diuretic that increase the uptake of potassium out of the bloodstream and delivers it to the kidneys for excretion. It can also stimulate insulin production in the pancreas.
- II. When – prophylactically 2-4mg every 8-12 hours during times when attacks are likely for up to 48 hours.

D. Results – They were amazing for Peppy. He now stands peacefully for grooming and tacking up. My family and clients couldn't believe the difference. My trainer noticed a gain of several inches in stride length the next lesson. I could feel a difference in his warm up, he starts out a little stiff, that will never completely go away, but he is much closer to what every horse feels like prior to warm up now. Dr. Brown can vaccinate and perform exams without fearing for her life. I had to buy new girths for him after the 1st month of his new diet. When the inflammation in his muscles was relieved the swelling went down and he went down from a 48" to a 46" in his jumping saddle and from a 24" to 22" in dressage. He is fierce over fences now too. He just carried a student to a first place finish at a combined training event (dressage and stadium jumping) last month. While he does not compete with me anymore he is still my best school horse. He will always be a high performance horse the rest of his life thanks to a great vet and years of research now available to owners, barn managers, and trainers like you and me. You can find photos of his work with my students and a [video](#) of the last dressage test we rode at a recognized show together on the [Heritage Stables](#) Facebook page.

Resources: My research on Peppy's condition led me to these sources for answers.

My vet – [Dr. Tracy Brown](#), equine sports medicine specialist at Scarlett Mobile Large Animal Services

UCDavis Veterinary Genetics Laboratory - [HYPP](#)

[AQHA Handbook](#)

FoundationHorses.com – [HYPP: Unmasking the Fatal Flaw](#)

Horse-genetics.com – [Impressive: A Tale of Triumph and Tragedy](#)

The Horse.com – [Feeding HYPP Horses](#)