

Stress, Acid and Survival

The Toll of Nutritional, Physical and Mental Stress in the Equine

Stress

Stress is a change in the environment that prompts a response. Any one thing you do affects ALL of you. All functions of your body are directly or indirectly related. ALL mental and physical activities stress the body. Stress is anything that causes the body to change the way it's functioning right now. Exhaustion from constant stress causes the body's systems and organs to shut down.

Nutritional Stress- (short or long term) What you eat and drink. For herbivores generally high protein, high sugar, acidic, processed feeds.

Physical Stress- (outside the body) Exercise, accidents, wounds, confrontations with others, the air one breaths, the environment one lives. Physical stress ends when the stress goes away.

Mental Stress- (inside the body) Mental interpretation of the world and your place in it. Worry, anxiety, fear, guilt, jealousy, etc. Since there is nothing directly to confront there is usually no closure.

Acid

The physical consequence of stress.

Survival

The body makes the perfect survival response *every* time. It responds to all stimuli, doesn't think, plan for the future or judge. It doesn't care if you are hurting or happy. It survives. If you don't like the response, change the stimulus.

Health or disease is the cumulative effect of physiological responses.

The choices you make determine your level of health, happiness and success.
You can never be separated from your choices.

Measuring Stress – Acid

pH- potential of Hydrogen (Whether ions are gathered or given off)

		Human/Equine	
		(6.8-7.4)/(7.4-7.9)	
Acid 0	2	7	14 Alkaline
(Bleach)	(Stomach Acid)		(Ammonia)

BLOOD pH

- Both ends are equally caustic. 7 is neutral
- The scale is exponential (6 is 10x as acid as 7, and 5 is 100x).
- 2 is Stomach Acid (Hydrochloric Acid)
- 6.8-7.4 Human Optimum
- 7.35 Human Blood carrying carbon dioxide by-product
- Blood pH has only a margin of 0.5 thus the body will pull all resources to maintain it.
- 7.9 -7.4 Equine Optimum
- Acid, a byproduct of animal/grain protein must be processed through the digestive tract, ultimately through the kidneys thus pH measure is generally via urine.
- Acidosis – increased hydrogen ion concentration.**
- The body responds to acid from any source with numerous systems and organs, using minerals already within the body if they are not otherwise available, to neutralize.
- Blood pH MUST be 7.2 or death occurs thus the body sacrifices other organs and systems to *survive*.

Symptoms of Acidosis

- Arthritis and other joint disorders
- Ulcers
- Ringbone
- Irritability
- Stiffness that works out
- Muscle wasting
- Ammonia smelling urine (signals exhaustion of the body's attempt to neutralize pH)
- Diarrhea
- Constipation
- Parasites
- Cancer
- Intestinal problems
- Reduced endurance
- Extended healing of wounds
- Cinchy
- Teeth Grinding
- Stocking up
- All "itis" diagnosis (a list far too long to list here)

Nutritional Stress

The horse is a monogastric herbivore (one stomach) designed to consume large amounts of grass and herbs. In its most natural setting horses roamed vast areas eating a variety of each as their systems required, their bodies making the choice. Today's single source diets of vastly depleted and toxin laden pasture present the equine with numerous nutritional challenges in the face of deficiency.

Except for the lack of a gallbladder and length of large intestine, the equine digestive system works and survives much like the human digestive system.

Equine Digestive Tract

-Mouth & Throat - Digestion begins with the side to side, almost circular, chewing combing food with saliva into a bolus which then travels along the approximately 4 ½ foot esophagus to the stomach.

-Upper Gut – Stomach and small intestine. Stomach has an 8-17qt capacity and can hold only .3% of their body weight at a time, perfect for consuming small amounts of fibrous food continuously. The stomach empties into the 17', 48 qt capacity small intestine where most of the protein, fat, vitamins and minerals are digested via enzymes. Since the horse has no gallbladder the liver constantly dumps bile into the small intestine. Nearly 50-70% of carbohydrate digestions and absorption and almost all amino acid absorption happen in the small intestine.

“Let's talk Ulcers” – The stomach produces acid continuously to accommodate the continuous forage the horse is intended to consume. Today's “managed” horses experience the stress of confinement, intermittent feedings, concentrated feeds and occasional NSAIDS and other various pharmaceuticals, wormers etc have high rates of ulcers. Some studies have found rates as high as 90%. Ulcers can be managed but studies have also shown that ulcers re-occur within 48-72 hours of the treatment ceasing. We ALWAYS assume the horse has ulcers to some extent. Further, while colonic ulcers cannot be easily diagnosed and are not recognized until the horse is obviously very ill, it is estimated that fully 2/3 of those horses with gastric ulcers also have colonic ulcers. It can also be assumed that the other 1/3 experience some degree of colonic inflammation or irritation. Symptoms are diarrhea, poor condition, attitude and performance, gritting teeth, colic, girthy, attitude under saddle.

-Hind Gut – (Cecum & Colon) The largest and most complex of any domestic animal, equines are designed to have constant supply of fiber to maintain normal gastrointestinal pH, motility and function. The cecum is 4' long with 30-40qt capacity and acts as a microbial vat for a period of about 7 hours breaking down undigested feed into vitamins, proteins and volatile fatty acids to provide constant energy and provide a first line defense against most disease causing bacteria and parasites. Both entrance and exit are at the top thus too much feed arriving at one time can reduce the effectiveness of the

bacteria causing compaction in the lower end and pain. The 12' long colon holds about 80-90 qts for 48-65 hours while microbial digestion occurs.

Because equine pH is a slightly more alkaline (consistent with an omnivore vs. herbivore) 7.9 to 7.4, excess protein presents a significant problem. Never should protein exceed the 12% found in mare's milk. The problems horses experience mirror those human's experience on high protein diets. Their greater sensitivity and consequential inflammation makes them truly miserable and compromises their comfort and performance drastically.

Alfalfa, a legume with 18-22% protein is one of the most frequent problems we find and for which an entire dissertation could be written. As significant as protein is, alfalfa presents an extraordinarily skewed cal/phos ratio. Horses need a 2:1 ratio and alfalfa can be as high as 1:8. Phosphorus, while necessary, is acidic. *"The only thing worse you could do for your horse's legs than have an imbalanced calcium/phosphorus ratio is to hit your horse with a shovel,"* Rex Ewing. Nothing complicates and compromises the horse's health, performance, attitude and long-term comfort more than alfalfa.

Alfalfa causes;

- Diminished performance
- Hyperthyroidism
- Tying Up
- Kidney problems and scratches
- Increased incidence of disease
- Enteroliths (intestinal stones)
- Development Bone Problems
- Colic
- Arthritis

Grain, essentially a foreign substance to horses as they do not have the enzyme amylase with which to digest it, is another major contributor to acidosis in the horse. Grain has high amounts of phytates that inhibit calcium absorption compromising bones and joints and can disrupt metabolism contributing to IR (insulin resistance or type II diabetes). Because grain stays only 2 of the 24 hour digestion time in the small intestine, it takes its acid load to the hind gut where it kills and disrupts local bacteria and can, in the extreme, cause founder. Grain puts the equine body in a continual survival mode contending with excess acid.

While grain can be a source for additional energy when required, numerous considerations should be made in that decision. Whole oats or a corn/oat/barley mix are suggestions in amounts not to exceed what is prudent for the individual. Only hard *working* horses or those in intense training need any grain. The horse on a healthy grass diet with mineral supplements to compensate for depleted sources can accomplish great deeds without grain. Feeding grain just to be feeding grain is unnecessary and compromises the long-term health of the horse.

Grain is a non-structured carbohydrate (sugar) and, like alfalfa, does not provide the benefit that roughage does. The best energy source for the horse is grass, which is digested in the large gut. Feed extra grass, not alfalfa, to help get through cold nights.

Good quality grass hay is simply the horse's staple. Any variation from it only exacerbates the multitude of other acidic contributors the horse faces. Remember also, horses source their anti-inflammatory omega 3's from grass.

Choose good sweet smelling naturally green grass. Grass that appears the beautiful blue/green many producers are so proud of is actually very high in nitrates (toxins) from fertilizers. Take a handful between your hands and pedal back and forth. If it breaks in two within 6-10 pedals it is full of nitrates. Nitrates test as proteins and are likewise very acidic.

Toxins-are anything with a molecular structure the body cannot identify. Even pharmaceuticals that have some good intent and affect some good results are, in the end, compounds the body must deal with.

Toxins, like excess protein and sugar, have an acidic or inflammatory effect on the body. They impair the liver, thyroid and mitochondria and attach themselves to receptor sites preventing the absorption of minerals, hormones etc. If they cannot be disposed of they are stored in fat where in the acidic environment they've created can potentially grow into significant cancers and other disease.

Symptoms of a depressed liver are depression, anxiety, and anger in humans and while humans are not horses the two systems are so similar we'd be remiss to ignore these facts. Further, Parkinson's has now been attributed to toxins with the implication to Alzheimer's, ADD, ADHD, autism and dementia. Again, the huge increase in these conditions over the past 30 yrs is hard to ignore.

Indications of Toxins in Humans (again, translate these to the equine equivalent)

- Acne
- Allergies
- Arthritis
- Bad breath, body odor, foot odor
- Bloating
- Depression
- Headaches
- Insomnia
- Lower back pain
- Constipation

Toxins are literally everywhere. It behooves us to avoid those we can and try to manage those we can't. We all must breath and drink and both bring with them a variety of

toxins. Emissions from vehicles, coal power plants, industry, fluoride, chlorine, fertilizer run off etc. are among those we can attempt to avoid. The list is long and distinguished.

While pharmaceuticals are indeed life savers and we wouldn't wish to be without, these too present significant toxic stresses. Healthy individuals can manage an onslaught of challenges. The introduction of any chemical, even preventative, will necessarily compromise that ability. The more compromised the individual, the more pharma administered, the less likely health will ever be restored. Worms for example. Healthy, well mineralized horses with balanced systems will have a natural symbiotic relationship with worms and never need worming. Horses that receive all sorts of vaccines, antibiotics, NSAIDS or who have toxin rich diets will always need to be wormed. Their systems are acidic and present an opportunistic environment for worms and every other parasite and disease. Because pharmaceuticals are toxins in and of themselves the individual can never achieve true health experienced from a balanced non-inflammatory system. While it is possible pharma administered to a *healthy* system on an as necessary basis during time of crisis can in most cases be rectified post-treatment, it is not always so. In some cases the damage will be long term or permanent and frequently totally unrelated, thus never recognized or attributed to the original event.

Toxins consumed daily with food such as preservatives, herbicides, and fertilizers present a variety of issues, many compounding. Tack rooms are full of optional choices (flax, beet pulp, molasses etc.) for one problem or another. All come with their associated side effects. Understand what each truly does before your administer it. You will pay for the consequence later.

Because of the horse's single source grass food supply and the vastly deficient pastures and fields it arrives from, mineral supplementation is an absolute necessity today. Choose a balanced chelated mineral supplement. As in your own diet, be very informed about labels, chemicals and additives. An improper choice on your part often creates more problems than it solves. These products too are expensive. You owe it both to the horse and your budget to be a wise consumer. Here are some

“Why not.....?”

Beet Pulp- Beets are chemically grown and extracted leaving behind a toxin load for the body to contend with. Frequently used to enhance weight, beet pulp requires four molecules of water to digest a single molecule of pulp thus most of the apparent weight is water not body mass or muscle tissue. Beet pulp encourages over consumption of water and kidney damage. It can contribute to colic and weakens the horse energetically.

Bran Mash- Often used as a laxative, bran mash is really only an intestinal irritant causing the body to expel all. Grass hay is a better fiber source and psyllium used one day or one week a month does more than frequent or ongoing psyllium use to remove sand. Bran will not remove sand. Black Oil Sunflower Seeds (BOSS) is another alternative to address sand. Bran is high in phytates and phosphorous, both tie up calcium.

Flax- Flax carries a toxin load, inhibits the thyroid and interferes with the absorption of B vitamins. Use can lead to fatal coronary heart disease, stroke and complications of pregnancy and reproductive health.

Mineral/Salt Blocks- It is physically impossible for the horse, a smooth tongued animal, to get the needed salt from blocks. Further, bleaching salt reverses the ionic effect on cell structure. Mineral blocks are essentially salt blocks with necessary glues and additives such as coloring and elementary (not chelated) minerals. Horses that go for a lot of salt or munch through a traditional mineral block are really looking for necessary minerals they cannot find. Horses that have only mineral blocks are minerally deficient and have a high toxin load.

Molasses/Sweet Feed- While food grade blackstrap molasses from sugar cane is very alkaline and has iron and other essential nutrients; the molasses used in sweet feeds and for other animal usage is chemically derived from beet pulp with all the attendant considerations. Some mixes are 50-80% molasses, an extraordinarily high sugar content promoting a sugar “high” and sugar “crash”. It is used to make minerally deficient sweet grains (which are no longer sweet and tasty) taste better and to cover up other miscellaneous ingredients (ie: floor sweepings). Because it is moist is also promotes mold so mold inhibitors and preservatives are also added. It is high in fluoride among the other variety of toxins. Sweet feed stresses the pancreas causing soreness in the lumbar area (sore loins, unable to round or collect or efficiently drive). A staple for geriatric horses, it couldn't be more inappropriate. If you need something to facilitate the administration of drugs use human food grade molasses or honey.

Vegetable Oil- Vegetable oil is fractionated fat (chemically separated from other nutrients rather than whole, as in natural grass heads or whole oats). It is not a complete whole food. The horse does not have a gallbladder, which emulsifies, thus it is digested thru the lacteal ducts in the intestine directly blocking the absorption of fat soluble vitamins. Frequently chosen to add weight it compromises long term health.

“About Minerals”

Minerals are the essence of what we are. When we are cremated what is left are “minerals”. Dust to dust. Add water and energy and you have life.

“You can trace every sickness, every disease and every ailment to a mineral deficiency”
Linus Pauling, MD, winner of two Nobel Prizes

Literally there is not a single function of the body that is not dependent upon minerals which;

-Insure equilibrium (balance) between internal and external pressure within individual cells.

-Are catalytic for both enzyme functions and anti-oxidant functions.

-Neutralize the acid metabolites produced by the digestive processes and ready them for elimination along with other toxins thus maintaining pH balance.

-Stimulate hormonal secretions which control growth, fertility & athletic ability.

-Function synergistically; the shortage of even one mineral can throw off the balance of the entire body rendering other mineral and nutrients inefficient.

Clearly some minerals are more important than others and while whole libraries have been written about the complexities of the relationship and interactions among them as well as deficiencies we are learning more every day. A basic understanding of who's who is in order here;

Macro-elements are those required in larger quantities. Calcium, phosphorus, sodium, chlorine, potassium, magnesium and sulfur.

Micro or trace elements are recognized as essential for good health. Chromium, cobalt, copper, fluorine, iodine, iron, manganese, molybdenum, nickel, selenium, silicon & zinc.

Essential minerals are those present in healthy tissue the lack of which produces poor health.

Nonessential minerals are those present due to contamination or excess and are not required for good health.

Chelated Minerals are *absorbable* as they are attached to amino acids. This is how nature intended and why minerals consumed in plant form are available to that which eats it. They are *organically* bound, no longer inorganic. The amino acid is efficiently (95%) absorbed by the body and takes along with it the mineral! Voila! Inorganic minerals, unchelated minerals are either excreted from the body or wind up in the liver and joints as toxic material upsetting the pH balance (acidosis/inflammation) and contributing to other diseases and problems.

Proteinated minerals are minerals that may or may not be attached to amino acids. Some manufacturers are simply mixing inorganic minerals with amino acids and selling them as amino acid chelates. They are not forming chemical bonds during preparation thus absorption rates can be as low as 1-6%.

Minerals are the key to nutrition, toxin removal and pH balance. The challenge is providing them without the incidental toxins of chemically fertilized pastures and hay crops. Choose the best quality clean, naturally fertilized (humizyme) grass hay and supplement with an appropriately balanced chelated mineral supplement for equines. Be proactive and do not feed anything that nature did not originally intend for the horse! When considering if you should feed something ask yourself first if nature intended it. Stay with the basics. As with yourself, avoid processed, concentrated foods high in protein and sugar. Most often owners do not equate performance and health issues with diet yet it is always the foundation for both health and dis-ease.

A balanced, mineralized horse will not be faced with cancer, worms or other parasites, sunburn, etc. A balanced, mineralized body simply does not provide opportunity for these issues thus chemical maintenance will not be required either.

Physiology of Physical & Emotional Stress

The Sympathetic Nervous System

The sympathetic nervous response is the flee mechanism of the prey animal or the first line of defense to consciously perceived threats that automatically kicks the body into gear to meet the threat. Most sympathetic responses prepare the body for strenuous activity of physical action. The WHOLE body responds. These responses are supposed to be short term reactions to stimuli. The sympathetic nervous system also responds to internally generated emotions, especially threat emotions. Emotions of excitement, anxiety or rage all get the body *reacting*. Even without an actual physical threat, strong negative emotions brought on by perceived or imagined danger can spark sympathetic threat responses. Since strong emotions can be difficult or impossible to be rid of the body stays in a constant “geared up” response mode ending finally in exhaustion exhibited in physical form. Threat emotion>heightened adrenalin>acidic/inflammatory system>cancer, ulcers, parasites, etc.

The body has responded perfectly to the stress but the effort to meet the pH blood requirement has depleted the resources required to maintain optimum health. Nutritionally speaking it has consumed all the calcium from the joints, muscle, tissues, etc to neutralize the acid pH of the blood, brain and heart.

Remember the body always responds to survive. The sympathetic nervous system is also in gear during exercise whether instituted by threat or not.

The Parasympathetic Nervous System

The counter balance to the sympathetic is the parasympathetic or the rein it in, cool your jets mode. Signals return organs back to a slower heart rate, digestion begins again, blood pressure lowers. With the threat out of the way the body turns off the sympathetic with the parasympathetic. A good visual here are horses grazing that suddenly stop eating and quietly focus in the distance for a perceived threat. Once the threat is evaluated as nothing they return to eating. Eating/digesting, like exercise/working to the sympathetic system, is a parasympathetic response.

Like the sympathetic nervous system the parasympathetic is also activated by emotions and this is where “stress” becomes the real killer. Horses, like humans, interpret the world through *memory*. An experience or feeling happens and we go back to our storehouse (cerebral cortex) of memories to find a similar occurrence. Memories of these experiences come attached with feelings. Whether these are positive or negative depends on our perception and interpretation of the circumstances and your feelings about the interpretation. Thus, everything we have already experienced now influences the future. Horses have long memories.

“fear”- elicits both sympathetic (high blood pressure) and parasympathetic (digestive juices, diarrhea). Fear should be short term. Now you know why the horse poops when you put him in the trailer.

“worry” - worry, depression and lethargy are long term parasympathetic responses. Stomach/digestive acids in constant production in the fragile equine digestive tract are acidosis in the making. Puts a whole new light on ulcers!

Emotions, be they sympathetic or parasympathetic triggers, can become stuck and keep the body responding. This is Sensory Dominant Stress (SDS). Messages from your sensory system dominate responses of your physiology. Either way we're into acidosis.

Like all things, these two systems should work together and find a state of homeostasis, balance. For the horse, however, a prey animal in a predator's world, this is pretty hard to find.

Physical Stress

As noted earlier physical stressors are those things outside the body that the horse must contend with. The list would seem never ending including training, confinement, weather, travel, competition, accidents, confrontation with others or lack of social herd contact, inadequate or non-existing foot care, saddle fit, electrical barriers, toxins, trains, planes and automobiles even our very own attitudes and emotional bearings. You get the idea. The horse has over the centuries become domesticated and is now sensitive to our every need yet his body and his innate needs as a free roaming prey animal are still firmly present. You can take the horse out of the country but you can't take the country out of the horse.

The human definition of physical stress is an actual threat or danger perceived through any of the five senses that initiates a physiological response for defense. These are the elevated heart rates, heightened states of awareness, adrenalin rushes and such of the sympathetic nervous system. Theoretically once the perceived danger is eliminated all returns to normal. However, as we said, in the case of the horse all too often the physical stress cannot be removed and the sympathetic response continues over time bringing the body to exhaustion. Being captive and all that encompasses is first and foremost the foundation for all equine stress. Far harder on the system than the occasional lion in the woods is the body's constant response to living in an unnatural environment.

Pens of varying sizes, stalls, artificial light, radios, electric fences, trailers, screaming crowds, automobile emissions, horns, cross ties, alfalfa, grain, molasses, vaccinations, wormers, shoes, saddles, bits, sunglasses, hats, shovels, prey animal caretakers, electrical high wires are but a few of the many too numerous to mention physical stressors.

An easy way to evaluate how stressful something in this category is think simply of the horse as nature intended, a wild prey animal upon the prairie. Anything that deviates from the picture is “stress”. While we can all adapt and find a comfort zone in that which is truly against our nature, the degree to which we must adapt is the degree to which we suffer stress.

Mental/Emotional Stress

While emotional stresses occur in nature too we must appreciate that much of these are incidental or consequential to the physical stress. Living the dynamic as equines know it must come with a large variety and many degrees of emotional stress.

While fear is the first response to most purely physical challenges they face, worry must be their constant companion. With the never really “understanding” of what is, what is to come next and the constant referral to memories of the past, frequently horrid, with which to base their interpretation and reaction, emotional stress is a given.

Further, domesticated as they are, they are keenly attuned to the energy of the people around them. People, who unfortunately, are many times suffering from fear and worry adjacent to living in today’s world. People who don’t appreciate that the horse’s prey animal senses pick up these incongruences and emotions as physical *and* emotional stimuli! Thoughts and emotions are tangible energies the horse senses. The human being is perhaps the single greatest stressor to the equine.

Some thoughts.....

Equine society is based on kinship and survival of the herd requires long-term stable relationships where there are defined roles and behaviors. Independence is an alien state which we routinely subject our horses to. Further, the constantly changing domestic social groups result in high levels of stress in the form of anxiety, resentment, depression and an unfulfilled longing to be part of a social group.

Colts weaned before nature would have intended are deprived not only of their mother’s socialization but of their mother’s adaptation skills.

Handlers and trainers of colts should always bear in mind that these early experiences, with emotions attached, will be stored in their memories and referred to for the rest of their lives and lay the foundation for the colt’s physical and emotional lives as well as their adaption and acceptance of expectations and requirements to come.

Horses like to be touched. Herd cohesiveness is reinforced by mutual grooming. They appreciate being consulted first.

Horses don’t understand being sold, changing places and faces. Domesticated horses first and foremost want to attach to the significant others, human and equine, in their world and endeavor to please most of all. They not only worry that they’ve done something

wrong but are fearful to an extent well beyond our understanding. “Tell” your horses in advance what is going to happen and why. They may or may not approve but at least they aren’t kept in the dark. Depression and anger frequently come hand in hand with “changing places”.

As social animals, horses establish leadership through space-taking. He who has the biggest space is dominant. Further, we should respect their space as we expect them to respect ours.

As prey animals, horses work on perceptions of energy (magnetic and electrical fields) not only of their environment but of us. *They know everything about us at all times. ‘They always know whether someone is coming from a place of self-interest or operating through compassion, an essential quality to have’*, said Margrit Coates.

“The horse is always disappointed with those who do not “walk the talk,” saying one thing but being incongruent, such as advocating natural horse techniques but then using pressure halters, hobbles, or flooding methods, causing emotional and/or physical pain.” Margrit Coates.

Horses follow authenticity and respond to aggression and dominance with avoidance.

Horses always “respond” thus they are always truthful.

When adrenalin from fear is up, learning is down. “Learned helplessness” is when the horse is forced into a state where he is completely stressed and has to surrender its will. Stressed horses are slow learners. The cortisol and prolactin constantly being pumped into their brains not only cause slow learning but potentially permanent disability due to brain atrophy. Round pens can be easily misused.

Gelding and branding as well as being held to be bred are as emotional and unnatural to the horse as they would be to the human and are never forgotten.

“Horses know the truth in any situation and putting ourselves in their shoes in whatever we undertake with them will lead us to knowing what that reality is.” Margrit Coates.

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Rowan Emrys, CNMT, “HorseSense” & “Living Energetically”
Dr. M. Ted Morter, Jr., “An Apple a Day”, & “Dynamic Health”
Margrit Coates, “Connecting with Horses” & “Healing for Horses”
Dynamite Specialty Products, www.dynamitemarketing.com.
Steven N. Harvey, “Minerals Right on Target”

