

## **NUTRITION RELATED PATHOLOGICAL CONDITIONS OF THE PERFORMANCE HORSE**

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### **Introduction**

The athletic horse is subjected to a variety of stresses ranging from extreme work bouts to exposure to sometimes pathological levels of environmental pollutants. Due to the taxing nature of exercise and training regimes horses may develop any number of potentially career ending or compromising pathological situations. Many of the problems associated with the athletic horse are thought to have nutritional components while others appear to have no association at all to nutrition, or at least not to the feeding program in use at the time the problems surface. It will be the goal of this paper to categorize ailments of the performance horse into three categories:

- 1) those problems with direct nutritional implications
- 2) those problems that may or may not have nutritional variables in their etiology and
- 3) problems with no reasonable nutritional explanation.

Obviously it is the tendency in many instances to blame nutrition if no other reasonable explanation exists. This attitude does nothing to move us forward, toward actually diminishing injury to the athletic horse and the resultant financial loss. Only those conditions with probable nutritional causes will be discussed in this paper.

### **Exertional rhabdomyolysis (ER)**

Tying-up, also known as exertional rhabdomyolysis, azoturia, myositis, set-fast, paralytic myoglobinuria, and Monday morning sickness, is a disease that has been around for as long as horses have done work for man. Early reference to the disease was in draft horses that after having not worked over a weekend, while on full ration, tied-up on Monday morning when put in harness and asked to work. The disease affects the muscle and may vary widely in severity, clinical signs and prognosis for recovery. Horses that develop myositis may show any one or a combination of the clinical signs listed in Table 1.

**Table 1.** CLINICAL SIGNS ASSOCIATED WITH EXERTIONAL RHABDOMYOLYSIS

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• Stiff and abnormal gait	• Increased body temperature
• Reluctance to move	• Profuse sweating
• Increased heart and respiratory rate	• May become recumbent
• Muscles painful to touch	• Myoglobinuria

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The prognosis for recovery of affected horses is in general related to the severity of the episode and the quality of medical care they receive during the chronic stage of the disease. Although all ages and sexes of horses are affected, the incidence appears to be greater in fillies and mares than in geldings or stallions. This suggests a possible endocrine relationship, but efforts to confirm a direct relationship between estrogen and the occurrence of the problem have not been fruitful.

For as long as the condition has been documented, efforts have been made to elucidate the cause and to develop strategies to prevent the problem. The result of these efforts has been the realization that the etiology of the disease is multifactorial and includes nutrition, genetics, environmental and endocrine factors. To ignore familial tendencies toward tying-up would be to defy conventional wisdom and the experience of trainers having trained several generations of a line of horses. It is common to find, in researching a case of myositis, that one or both of the parents of an affected horse were known to have tied-up. Besides the previously mentioned possible role of steroid hormones, thyroid hormone has been mentioned as a possible factor which initiates the disorder. Hypothyroid, heavily stressed horses, have been known to develop chronic muscle problems and some have benefitted from thyroxine supplementation. An in depth discussion of the biochemistry of all of the possible causes of this disease is beyond the scope of this paper; however, I would be remiss if non-nutritional contributing causes were not at least mentioned. The nutritional connection to myositis revolves around two major areas:

- 1) management of grain intake and muscle glycogen status and
- 2) maintaining proper electrolyte and pH balance in the working muscle.

The most classic example of tying-up is in response to full grain feeding during periods of inactivity (usually a day or two) followed by a return to training. This cause may really be one of nutritional and training mismanagement rather than being strictly dietary. Nonetheless, when horses are to be rested it is prudent to drastically reduce the amount of grain that is being fed.

In some instances selenium and vitamin E supplementation have been reported to be effective in the treatment/management of the disease. In many cases adequate levels of vitamin E and selenium have neither prevented nor been effective in preventing the reoccurrence of the disease. Even so, field experience has resulted in the practice of dietary fortification with both selenium and vitamin E.

Recently there has been increased interest in potassium concentration shifts or in lowered intracellular potassium as a possible cause of exertional rhabdomyolysis. In many cases RBC or intracellular potassium concentrations are lower than normal in affected horses and when the problem is corrected using potassium chloride, there is a decrease in the incidence of ER.

## **Anhydrosis**

Anhydrosis is the inability to sweat in response to work output or increases in body temperature. The condition may also be referred to as “dry coated.” The condition may develop gradually with normal sweat output associated with exercise followed by decreased sweat output with successive exercise bouts, or may be precipitated by one bout of exercise. Most “dry coated” horses are athletic horses though frequently the condition appears in pastured horses not being ridden. Anhydrosis most commonly occurs when both temperature and humidity are high as in the southern US or in subtropical areas such as Brunei, Jamaica or Singapore. Horses reared in temperate regions and then transported to hot climates are most prone to develop the condition, but even “hot climate acclimated” horses are seemingly at risk.

The exact cause of anhydrosis is not well elucidated. Clinical signs include inability to sweat, increased respiratory rate, elevated body temperature and decreased exercise tolerance. Due to heat stress, affected horses will go off feed, lose weight and show signs of depression. These are inconsistent signs with respect to histological findings in skin but alteration of sweat glands is a common occurrence. The condition almost always requires a combination of high temperature and high humidity for its development and the most effective treatment is moving the affected horses to a cooler climate. Resumption of normal sweating is frequently observed on horses moved to more favorable environments, but the prognosis is guarded in horses not moved. Some success has been achieved by placing horses in air conditioned stalls, but work intolerance may persist when the affected horses are worked outside. Anhydrotic horses are prone to suffer from heat stroke (usually fatal) and other forms of heat stress and as such are not suitable for athletic events if recovery is not achieved.

From a nutritional standpoint, electrolyte imbalances or inadequacies are the most frequently indicted causes of anhydrosis. Inadequate sodium, chloride or potassium in the diet coupled with extreme electrolyte loss in the sweat has been thought to precipitate the condition and hyponatremia and hypochloremia are frequently seen in anhydrotic horses. Nonetheless, a great many horses are not helped by electrolyte therapy nor does the condition seem to be prevented by prophylactic electrolyte administration. Even so, it is wise to consider electrolyte supplementation in “at risk” horses. Any number of drug therapies from ACTH to calcium-pantothenate administration have been tried with limited to variable success, so exact cause and manner of dietary interaction remain unclear.

### **Synchronous diaphragmatic flutter (thumps)**

Synchronous Diaphragmatic Flutter (SDF), also referred to as “thumps,” is characterized by contraction of the diaphragm in synchrony with the heart beat. Affected horses are observed to have a noticeable twitch or spasm in the flank which may be pronounced enough to cause an audible thumping sound which is where the common name of the condition came from.

SDF is most commonly seen in electrolyte depleted/exhausted horses. Other anomalies associated with SDF include dehydration, decreased plasma volume, gut stasis (lack of gastro-intestinal mobility), and metabolic alkalosis. Consistent findings include lowered plasma chloride, calcium, sodium and magnesium concentrations, and aggressive electrolyte therapy is both preventive and of therapeutic value. There is some indication that horses on excessive calcium intake may be very susceptible due to their inability to mobilize calcium rapidly enough to meet exercise induced requirements.

### **Heaves**

Heaves, also called chronic obstructive pulmonary disease (COPD), has been associated with “winded” horses. COPD is a hyperallergenic response of the respiratory system similar to that seen in human asthma. Affected horses may cough, develop a nasal discharge and have excessive tearing of the eyes. Respiratory rate is increased, and lung elasticity diminished, and in some cases a characteristic “heave” line develops due to muscular hypertrophy associated with the increased expiratory effort needed. Additionally expiration may become biphasic.

The most important aspect of treatment is recognition of its cause: exposure to dust, mold spores and respiratory irritants such as ammonia. Horses affected with COPD are best kept outside and managed in pastures rather than in stalls. When this is not possible, horses should be bedded on dust free bedding such as shredded paper or on rubber mats rather than on straw, hay or wood shavings. Horses would be removed from the barn during management procedures likely to increase the amount of dust in the air (cleaning and re-bedding of stalls, sweeping the aisle, filling or cleaning hay lofts).

Particularly challenging is continuing to meet the horse’s fiber requirement while minimizing exposure to causative agents. Frequently the problem can be controlled by wetting hay before feeding it which reduces particulate matter such as dust and mold spores and as such the irritation of the respiratory tract. Many times alternative fiber sources such as grass cubes, soaked oaten or wheaten chaff have been used effectively to manage horses with COPD but particularly effective has been the use of diets containing shredded beet pulp as the predominant fiber source. These diets are characteristically up to 30% beet pulp and 20% molasses.

Affected horses may also respond favorably to the use of expectorants to reduce coughing and to the use of bronchodilators to reduce respiratory rate and airway resistance.

### **Degenerative joint disease (DJD)**

Degenerative joint disease (DJD) is second only to tendinitis as a cause of removing race horses from training. Though there is no specific evidence to suggest that DJD is the result of nutritional disorders at the time at which clinical signs appear, one must wonder if early nutritional mistakes might not subsequently precipitate the appearance of the disease. DJD consists of a multitude of clinical manifestations including degeneration of articular cartilage, subchondral bone, and other bone comprising both the articular and periarticular aspects of the joints. Cartilage/bone anomalies are most frequently described in the joints distal to the radius in the foreleg and femur in the hindleg. Suggested causes include repeated trauma (wear and tear), conformation faults (straight pasterns, stifles, etc.), joint septicemia, traumatic joint injury, subchondral bone defects (OCD lesions) and intra-articular glucocorticoid administrations to name a few of the more common ones.

It is beyond the scope of this paper to describe in full the relationship thought to exist between developmental orthopedic disease (DOD) and DJD which might then occur. However, some workers suggest that OCD and other defects (subchondral bone cyst) associated with DOD are the primary causes of catastrophic breakdown of race horses as well as traumatic, but equally important injuries, including carpalis, synovitis, sesamoiditis and various manifestations of DJD. As such, early nutritional management has a rather marked and serious effect on potential performance of the horse and the prevention of at least some of the pathological conditions of the athletic horse.

The use of methyl sulfonyl methane (MSM) in the treatment of arthritic disease in the horse has received some attention and varying degrees of support among both equine veterinarians and horsemen. There are no real data from controlled experiments to suggest that MSM (closely related to dimethyl sulfoxide - DMSO) has therapeutic or prophylactic value but the clinical experience of some veterinarians suggests it may be helpful. One could postulate that as a source of sulfur, MSM may contribute to the maintenance of the articular cartilage matrix; however critical research needs to be conducted before any conclusion can be reached regarding the effect or lack of effect of using MSM (or perhaps other sulfur sources) on the prevention or treatment of cartilage/synovia disorders of the performance horse.

