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CUSHING'S DISEASE AND OTHER PROBLEMS OF THE OLDER HORSE

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Introduction

In recent years, great strides have been made in the nutritional management of the older horse. Changes in digestive function (e.g., poor teeth) and the development of chronic illnesses such as Cushing's syndrome can alter dietary needs and dictate a change in dietary management. This paper will review what is known regarding problems of the older horse, with an emphasis on (1) known alterations in nutrient requirements and/or metabolism, and (2) dietary management to improve body condition and quality of life.

Demographic information suggests that older horses (e.g., more than 15 to 20 years of age) now comprise a much larger proportion of the overall horse population. More than ever, the horse is a treasured companion, and we strive to ensure that this rewarding relationship lasts for as long as is reasonably possible. Just what do we mean by old? There are no hard-and-fast rules. We do know that few horses survive into their 30s or 40s, but many horses do quite well until their late 20s. Geriatric and senior are terms frequently used to describe horses in this elderly age bracket. However, geriatric really refers to old humans or animals with problems and diseases. Old but otherwise healthy horses are just that – old.

Effects of Aging

The adage "you are only as old as you feel" perhaps also applies to horses. Some horses may begin to "slow down" in their late teens, while others may remain quite vigorous in their mid-20s. In many different athletic disciplines, there are numerous examples of horses remaining highly competitive until their late teens or even beyond. The reason for this difference is unknown. As in humans, it is possible that genetics, diet, and exercise history play some role in determining life span. In many horses, signs of aging are evident after 20 years of age. These signs include graying of the hair, particularly around the eyes, temples and nostrils, development of a sway back, increased prominence of the backbone, and poor dental health.

Dental problems are common in old horses and frequently result in loss of body weight and an inability to maintain condition. The most common dental problems include excessive wear, missing teeth, and abnormal wear patterns such as "wave mouth." Tooth decay and gum infections (periodontal disease) are also more common in older horses. The most obvious effect of dental problems is a decrease in feed intake. Decreased feed intake can be attributed to pain and an inability to properly chew dietary fiber. The latter is frequently manifest as "quidding" the feed; partially chewed wads of hay are dropped out of the mouth. Poorly chewed hay and fiber can also predispose the horse to choke because of lower than normal saliva production during mastication (the chewing of food). With decreased saliva production, there is less lubricant to aid the passage of ingesta through the esophagus.

Aging may adversely affect digestive function. In one study, the digestibility of protein, fiber, and phosphorus were lower in mares over 20 years of age compared to mares less than 10 years of age (Ralston et al., 1989). As the digestive profile of the old mares was similar to that reported for horses that had undergone resection of the large bowel (90% removed), these changes in digestibility were attributed to large intestinal dysfunction. However, more recent studies by the same investigator have largely refuted these earlier findings (Ralston et al., 2000). The authors hypothesized that poor dentition and/or the effects of parasitic larval migration in the large intestine were responsible for the lowered fiber, protein, and phosphorus digestibility observed in the earlier study (Ralston et al., 2000). More research is required to clarify these issues.

Some authors have suggested that decreased liver and kidney function is common in old horses. Although chronic liver and kidney failure are occasionally diagnosed in old horses, these problems are much less common than, for example, dental disease. More research is necessary to characterize the effects of aging on liver and kidney function in horses and the role of diet in the management of these problems. Chronic inflammatory respiratory disease is more common in older compared to younger horses, and this condition is discussed elsewhere in this proceedings. Another relatively common problem of older horses, Cushing's disease, is discussed later.

Feeding the Old Horse

Dietary fiber is the most important consideration when designing a diet for the old horse, particularly in circumstances where there are dental problems. Horses with moderate to severe dental abnormalities will do poorly on a predominantly hay diet, particularly when the hay is of low quality. Imperfect mastication will impair assimilation of energy and other nutrients from the feed, the result being progressive weight loss. Ideally, the older horse should have daily access to pasture as grass is easily chewed and digested and even horses with poor dentition can do

reasonably well during the spring and summer months when given plenty of grazing time. An exception would be the horse who has damaged or missing incisor teeth.

Horses with poor dentition will require alternative fiber sources to ensure adequate fiber intake (e.g., hay cubes, hay pellets, chaff, beet pulp, soy hulls). Some horses will still have difficulty chewing hay cubes. In some cases, presoaking the cubes will aid mastication. Horses with very poor teeth are sometimes unable to properly digest the fiber contained in hay cubes or chopped hay, simply because they cannot adequately chew the ingested material. Mushy feeds such as soaked hay pellets or beet pulp can be used in these situations.

An easy method for provision of dietary fiber is the feeding of a complete "senior" feed. Most of the senior feeds on the market contain a fiber source such as alfalfa meal, soy hulls, beet pulp, or a combination of these ingredients. These feeds also contain grains which have either been extruded or processed into other highly digestible forms (e.g., rolled, steam flaked). These pelleted or extruded feeds are easy to chew, thus helping to prevent problems associated with poorly chewed feeds. For horses with very poor teeth, it is recommended that these feeds be soaked in water prior to feeding.

A well-formulated senior feed should contain, at the minimum, 12% dietary fiber and a protein percentage between 12 and 16%. The latter is often achieved by including soybean meal in the formulation. If there is evidence of decreased renal function, protein content should not exceed 12% and excess calcium should be avoided. Yeast and other digestive aids are also included to improve fiber and phosphorus digestion. Mineral and vitamin fortification should be higher than that for a standard maintenance horse feed to account for a possible age-related decline in digestive efficiency. Although these diets can be fed without other forage, it is always preferable to provide the horse access to some high-quality forage in the form of pasture or first-cut hay with a high leaf to stem ratio.

As weight loss and failure to maintain body condition are common problems in older horses, increasing the energy density of the diet by the addition of fat is a logical strategy. Oils such as corn, canola, and linseed are often added to commercial senior feeds, providing a 4 to 6% fat ration. If more calories are required, additional oil (e.g., 100-150 ml) or 1-2 lb of rice bran (20% fat) may be fed. Rice bran (and oil) contains gamma-oryzanol, a steroid-like compound that is purported to have anabolic effects in muscle.

It is generally necessary to feed older horses by themselves; in group situations, the younger, more dominant horses will often drive the older horse away from feed, contributing to weight loss problems.

Cushing's Disease (Equine Hyperadrenocorticism)

A reasonably common disorder in older horses is Cushing's disease or equine hyperadrenocorticism. This condition is caused by a tumor of the pituitary gland,

specifically a pituitary pars intermedia adenoma (PIA). The disease is primarily attributed to an overproduction of pro-opiomelanocortin (POMC) peptides by the pituitary, including adrenocorticotrophic hormone (ACTH), ß-endorphin, and α-melanocyte stimulating hormone (MSH). In normal horses, the secretion of these peptides is under negative feedback control. For example, ACTH stimulates the adrenal glands to synthesize and secrete the glucocorticoids (cortisol and corticosterone). An increase in circulating cortisol, in turn, signals the pituitary to stop secretion of ACTH. In this manner, the body is able to regulate cortisol concentrations within a fairly narrow range. Other endocrine problems can arise when the PIA encroaches the neighboring tissues, particularly the hypothalamus and neurohypophysis.

Cushing's disease has been reported in horses and ponies. Although affected horses and ponies are typically greater than 15 years of age, there are reports of cases in horses as young as 7 years. In four reports, the mean age of affected horses ranged between 18 and 21 years (Boujon et al., 1993; Heinrichs et al., 1990; Hillyer et al., 1992; van der Kolk et al., 1993). There is no apparent sex or breed predilection, although an increased prevalence in ponies has been reported (Hillyer et al., 1992).

The onset of clinical signs can be very gradual (e.g., over a period of 1-4 years). The most remarkable clinical sign in horses and ponies with Cushing's syndrome is hirsutism, an excessively long and curly hair coat. Frequently, the owner will report that the horse or pony failed to shed out in the spring. Black and dark brown hair can lighten in color (usually to a golden brown). The other common clinical signs are weight loss and muscle wasting (frequently with a potbellied appearance), lethargy, hyperhidrosis (excessive sweating), and bulging of the orbit due to an increase in fat deposition around the eyes. Some horses will have increased appetite (polyphagia) and thirst (polydipsia) and an increase in urine production (polyuria). It is important to note that horses with Cushing's disease can present with any combination of these clinical signs; it is rare that an individual horse will display all of the common abnormalities.

There are two major secondary complications of PIA: laminitis and diabetes mellitus with concurrent weight loss. In one case series, 38% of affected horses had signs consistent with diabetes mellitus and 24% were laminitic (van der Kolk et al., 1993). The cause of laminitis in Cushing's disease horses is unknown. Some have proposed that elevated cortisol concentrations results in constriction of the digital blood vessels. Another theory proposes that insulin dysfunction is an underlying mechanism. As insulin is a vasodilator, insulin resistance could also result in peripheral vasoconstriction and laminitis. Regardless of the cause, chronic laminitis is a major problem in horses with Cushing's disease. Recurrent episodes often lead to rotational changes in the distal phalanx and a predisposition to development of sole abscesses. Abnormalities in hoof growth can also occur; affected ponies can develop very long overgrown toes ("pixie shoes").

Diabetes mellitus is attributed to insulin resistance and results in hyperglycemia and, in most cases, polyuria and polydipsia. Other complications include recurrent bacterial or fungal infections, delayed wound healing, blindness, seizures, and diabetes insipidus. Because persistently high cortisol can suppress the immune system, it is thought that the increased susceptibility to infection is a sequelae to immunosuppression.

Diagnosis of equine hyperadrenocorticism is a challenge. Routine hematology and blood chemistry can reveal abnormalities characteristic of the syndrome (e.g., hyperglycemia, increased plasma triglycerides), but these alterations are not present in every case. Some form of dynamic endocrine testing is required for a definitive diagnosis. The dexamethasone suppression test (DST) is commonly used. In normal horses, a small dose of dexamethasone results in a marked suppression (>60-70%) in plasma cortisol 24 hours later (Dybal et al., 1994). However, horses with PIA are usually unresponsive to the dexamethasone (i.e., cortisol concentrations remain unchanged). Another useful test is the measurement of the ratio of urine to plasma cortisol concentrations; this ratio is markedly increased in many horses with PIA.

There is no cure for PIA, and the prognosis is guarded to poor depending on the number of complications present at the time of diagnosis. However, medical therapy can result in clinical improvement in some affected horses. Currently, the drug pergolide is the treatment of choice for horses with PIA. Pergolide, a dopamine agonist, suppresses the secretion of ACTH by the pituitary, thereby decreasing the stimulus for cortisol production. Clinical improvement can be seen in as little as 3-4 weeks.

Given the increased susceptibility of PIA horses to infections, a top-notch preventive health program is necessary. Vaccination and deworming programs must be adhered to and minor ailments, such as skin infections, should be aggressively treated. Regarding nutritional management, a case-by-case approach is necessary when making recommendations. Some PIA horses are overweight, necessitating a restriction in dietary energy while ensuring provision of adequate protein, minerals, and vitamins. Others are thin and require a more energy-dense diet.

High starch diets may exacerbate diabetes mellitus and increase the risk for further episodes of laminitis. Therefore, a low starch diet is usually indicated for horses with PIA. Although fat can be a useful substitute, it should be recognized that dietary fat is associated with development of mild insulin insensitivity. For this reason it is preferable to feed a diet that emphasizes highly digestible fibers (e.g., non-molassed beet pulp, alfalfa meal) rather than fat. A chromium supplement is also recommended. Chromium has been demonstrated to improve insulin "effectiveness." Therefore, chromium supplementation may help in the control of diabetes mellitus in PIA horses. Supplemental vitamins (E and C) and zinc may be useful to ensure optimal function of the immune system.

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