

Large Animal VETERINARY Rounds®

MAY/JUNE 2007
Volume 7, Issue 5

AS PRESENTED IN THE ROUNDS OF THE DEPARTMENT OF LARGE ANIMAL CLINICAL SCIENCES
OF THE WESTERN COLLEGE OF VETERINARY MEDICINE, UNIVERSITY OF SASKATCHEWAN

Management and Care of the Geriatric Horse

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Care and management of geriatric horses is becoming an issue of increasing importance within the equine industry. As a result, veterinarians should be prepared to provide medical care for aged equine patients and advice to horse owners. This issue of *Large Animal Veterinary Rounds* addresses common management concerns pertaining to the aged horse with a focus on nutrition and dental care. Considerations concerning exercise, vaccination, and deworming of aging horses are also discussed. Common disease conditions in the aged horse population and other medical considerations giving specific attention to geriatric horses will be discussed in a future issue of this publication.

Demographics of the geriatric horse population

Geriatric horses are estimated to account for approximately 7% to 20% of all horses,^{1,2} but despite speculation about aging horse populations, data showing an increase in these percentages are lacking. Ponies are consistently over-represented among aged horses. Interestingly, a recent retrospective study concerning the geriatric horse population at a veterinary teaching hospital in the United States² revealed that the proportion of geriatric horses among the entire hospital population increased from about 2% to 12.5% in a 10-year period. Therefore, growing concerns for these geriatric horses may be more important than an overall increase of aging horses. Owners and veterinarians may also be increasingly aware that proper management and medical care can extend the lifespan of these animals. Attending veterinarians play an important role in preparing owners for managing an aging horse and client education should be an important objective in every client-owner-patient relationship. Importantly, many problems (eg, dental disease or parasitism) in aged horses may be prevented by attention to regular veterinary care throughout the horse's life. Aside from purely medical concerns, veterinarians need to recognize that, often, aged horses have been owned for long periods of time and the owners may have considerable emotional attachment to the animal. Owners' concerns may shift from the preservation of performance to quality of life issues and veterinarians will be expected to provide advice in this context. Veterinarians should also be sensitive to the human-animal bond when addressing issues such as weight management, chronic pain, the need for life-long treatment of conditions (eg, pituitary dysfunction), the "value" of surgical procedures or, ultimately, the need for humane euthanasia in chronically ill aged horses.

The definition of a geriatric horse varies among publications and authors. In most cases, definition is by age and the cut-off is often placed at 20 years of age. Some authors further distinguish between "old" and "very old" horses and categorize the latter group as those animals >30-years-old.² From a conceptual standpoint, geriatric animals can also be defined as those displaying physical characteristics of old age or as those with health or management problems related to aging. Physical characteristics indicative of old age in horses have been described as swayback, drooping lips, deepening grooves above the eyes, graying hair, and increasing wear of teeth and hooves.³ Age as a risk factor for disease has received some attention in the veterinary literature; however, few conditions appear to affect geriatric horses exclusively. In one retrospective study,² the reasons for presentation included a wide range of conditions and colic was the most common overall complaint. The management of a medical condition in an older horse may be of greater importance than the diagnosis itself.

Weight loss and feeding

While obesity can be a major problem in a horse of any age, failure to maintain adequate body condition or weight loss in the face of perceived adequate feeding strategies are frequently encountered



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The editorial content of *Large Animal Veterinary Rounds* is determined solely by the Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine



The Canadian Veterinary Medical Association recognizes the educational value of this publication and provides support to the WCVM for its distribution.

in the aged horse. In their evaluation, veterinarians should consider the principle mechanisms of weight loss: underfeeding, protein-calorie malnutrition, inability to eat, anorexia, increased nutrient requirements due to physiologic or pathologic conditions, and nutrient loss. In cases of underfeeding and protein-calorie malnutrition, the provision of appropriate types of feed rather than increasing feed intake overall may be the more important concern; this requires owner education and compliance. As well, rank order of geriatric horses within groups and the potential for chronic pain as a cause of decreased feed intake must be taken into account when evaluating complaints of weight loss.⁴ Even horses that are group “leaders” in younger years can lose this position as they get older. Rearranging horse groups by age category and providing more accessible feed sources to avoid long walking distances may be appropriate strategies on some farms, and may alleviate competition as a cause of decreased feed intake.

Energy requirements

Maintenance energy requirements are not thought to increase significantly with age and National Research Council (NRC) requirements for adult horses can be used as a reference. For a 500 kg horse, 16.4 Mcal of digestible energy per day are suggested,⁵ which roughly equates to 1.5% to 2% of body weight in forage, or approximately 7.5 to 11 kg of hay per day, depending on feed quality and energy content. While these numbers provide an easily calculated, appropriate starting point for ration formulation, it is important to recognize that they represent maintenance requirements and do not account for exercise, and physiologic or pathologic catabolic states, such as chronic disease or adverse climates (especially cold). More research is needed to elucidate the effects of chronic diseases such as pituitary dysfunction and chronic pain on energy requirements in geriatric horses. As a general rule, however, feeding regimens probably need little or no adjustment in aging horses as long as body weight and condition are maintained. Owners should be instructed to use body conditioning scoring systems⁶ and/or weight tapes as methods to monitor their horse’s condition. Obesity should be avoided as much as an overly thin condition. Some suggest that changes in body condition (eg, weight gain in thin horses) are more difficult to attain in geriatric horses.³

Energy sources

While good quality forage is generally considered an appropriate sole maintenance feed source for horses, dental disease and changes in nutrient metabolism may make aged horses unable to maintain their body condition on an all-roughage diet. Serious dental disease can result in inappropriate mastication of roughage, quidding, slow eating, or even refusal to eat because of pain. While regular dental care can prevent some of these problems, alternative feed sources should be considered in horses failing to maintain body weight and condition despite dental correction, and in those without enough tooth length left to ensure adequate mastication of hay. Complete pelleted feeds are an excellent alternative to roughage and provide a palatable, easily chewed, and readily digestible energy source (Table 1). Complete feeds are those

Table 1: Composition of one complete pellet (Nutrena® Life Design Senior) formulated for geriatric horses. The daily recommended amount for a 500 kg horse fed this ration exclusively is 6-7 kg (12-14 lbs per 1000 lbs horse) for maintenance and 7-8 kg for light work. See <http://www.nutrenaworld.com> for further details.

Crude protein	14% minimum
Crude fat	5% minimum
Crude fibre	16% maximum
Calcium	1.2%
Phosphorus	0.7%
Sodium	0.35%
Salt	1%
Vitamin A	28,000 IU/kg minimum
Vitamin D ₃	2,850 IU/kg minimum
Vitamin E	165 IU/kg minimum

that meet all dietary requirements, including roughage, and allow exclusive feeding. Care should be taken not to confuse sweet feeds or supplemental feeds with complete diets. Currently, many senior diets are available that combine the benefits of a complete pelleted feed with a higher protein and fat content, and balanced mineral supplementation. Unless medical reasons (eg, recurrent choke) prohibit hay feeding, supplemental hay should be provided to horses on complete diets to allow the satisfaction of chewing needs. This will also prevent boredom and the development of vices that may occur if intake of pelleted diets does not occupy enough time. When pelleted diets are to be fed exclusively, the changeover must be made gradually and the amount of feed adjusted to the individual horse to avoid overfeeding or underfeeding. Often, approximately 15 to 20 lbs of complete feed are required per day to satisfy maintenance requirements; thus, owners should consider cost before committing to a new feeding regimen.

Many alternatives to complete senior diets exist that can provide increased energy intake at a reasonable cost. Beet pulp and grains or sweet feeds can be fed in addition to hay, but they provide energy mainly in the form of carbohydrates. As a result, they may be contraindicated in horses with chronic laminitis or insulin resistance, which is frequently encountered with pituitary dysfunction. Contrary to former beliefs, horses are capable of digesting fat sources of energy and supplementation with fat is often preferable to high-carbohydrate diets. While supplemental feeds with higher fat content are available commercially, owners can also add vegetable oils such as canola oil or corn oil to the horse’s diet. For an average-sized horse, up to 2 cups of oil can usually be fed per day;⁷ preferably, these are given in two or more daily feedings with small amounts of beet pulp or grain. Owners should be instructed to start with smaller volumes (eg, one tablespoon per day) and increase the amount of oil gradually over a 2- to 3-week period. This allows horses to acquire a taste for the supplement and prevents

digestive upset due to sudden changes in diet. Oils should be stored properly and used in an appropriate amount of time to prevent them from becoming rancid.

Digestive capacity

Overall energy requirements change little with advancing age in horses, but digestion of certain nutrients may be reduced. Reduced utilization of protein, fiber, and phosphorus has been demonstrated, whereas calcium utilization does not appear to change.^{8,9} As a result, feeds with higher protein concentrations (12%–16%) may be preferable, while very high-fiber content may lead to reduced nutrient utilization. Mineral supplementation to increase phosphorus content of diets for older horses may be advisable; however, a calcium:phosphorus ratio of about 1.5:1 should be maintained.⁷ Changes in dietary protein concentration and/or mineral content should be made carefully in horses with demonstrated renal or liver disease. Chronic parasitism has been cited as a cause of decreased feed digestibility in geriatric horses;¹⁰ therefore, attention to proper parasite control is advisable. The use of extruded feeds or the addition of yeast cultures (eg, Brewer's yeast; 2 to 4 ounces) have been suggested as means to improve feed digestibility in horses with problems maintaining adequate body condition.⁷ Brewer's yeast has the added benefit of providing the horse with supplemental B-vitamins. Supplementation of Vitamin C (2 to 10 g daily) has been suggested for horses with pituitary disease and may offer the benefit of increasing antibody responses in aged horses.⁷

Water intake

Similar to geriatric human patients, water intake may be reduced in aged horses. This may be due to oral pain if dental disease and/or gingivitis are present, or to decreased thirst perception with age. Potential consequences of decreased water intake are low-grade chronic dehydration leading to reduced exercise tolerance and predisposing to impaction colic or renal dysfunction. To avoid choke, adequate water intake is particularly important when feeding diets that depend on sufficient volumes of saliva formation (eg, alfalfa pellets or other pelleted diets). Options for increasing water intake in horses include soaking hay or other roughage (eg, feed cubes) prior to feeding, feeding mashes and slurries, or adding salt to the diet to increase thirst. Soaking feed has the disadvantage of reducing nutrient content and should not be adopted as a long-term solution. Free access to salt blocks or addition of loose salt to the diet (50–75 g/day have been recommended for prevention of urolithiasis in a 500 kg horse)¹¹ may be helpful in some horses; however, owners must ensure free access to water at all times. Testing for adequate renal function is advisable prior to adding salt to the diet. In horses suspected of drinking less due to oral pain, dental correction and provision of a heated water source can aid in reducing discomfort. Heated water sources should also be considered for horses kept outside during the winter, but regular safety checks on equipment must be maintained. Ready access to clean water must further be ensured in horses with chronic pain (eg, chronic laminitis), since these horses may not drink enough if they must walk long distances to reach a water source.

Dental care

Dental disease is a common problem in aged horses and may result in improper feed digestion, weight loss, dysphagia, decreased performance, and chronic pain. Regular dental examinations by a veterinarian are recommended for all horses and more frequent examinations (every 6 months) may be advisable in aged horses. Dental examinations should be included as part of the physical examination in all aged horses, no matter the presenting complaint. In one study,² most of the dental disease in aged horses was identified during the physical examination of a horse presented for a different primary concern. Regular examinations provide an opportunity to detect early stages of dental disease and timely corrections of dental irregularities can prolong dental health in horses as they age.¹²

Changes in dentition with age

Horses have hypsodont teeth resulting in tooth “growth” throughout their lifetime. Tooth wear due to grinding motions of mostly roughage feeds has been estimated at 1 to 4 mm/year.¹³ As opposed to the true addition in tooth length in younger ages, lengthening of the crown in aged horses is due to the gradual movement of the entire tooth out of its socket (alveolus) and the reduction of alveolar depth.¹³ This process must be kept in mind when performing dental work in aged horses; although tooth extractions may be easier to perform, the risk of injury to the alveoli or the sinus (in maxillary teeth) may be increased. Reduction in tooth length due to rasping or floating may be permanent in old horses with minimal crown reserve. Therefore, improper dental correction may result in teeth being taken out of occlusion permanently, with a resultant inability to masticate properly. In addition to length, the radiographic shape and visible presence of tooth roots will change with age and short teeth in very old horses may develop vertical fractures.¹³ Since horse teeth taper from crown to root, shortening of teeth with age naturally leads to formation of diastemata between the teeth that predispose horses to feed impacting and the development of periodontal disease.¹⁴ Tooth wear ultimately leads to formation of a “smooth mouth” in which all enamel ridges have disappeared from the premolar and molar teeth,¹⁵ and no functional grinding surface remains (Figure 1).

Common dental diseases in geriatric horses

Dental diseases most commonly encountered in aged horses include abnormal and irregular tooth length, tooth loss, and periodontal disease. Sinusitis may also be more common, especially in horses with pituitary dysfunction. In a review of 85 dental radiographs of 75 aged horses and ponies (>15-years-old, range 15–41 years),¹³ ramps and hooks were detected in most cases (86.7%). Wavemouth was present in 52% and tooth loss in almost 10% of cases. Interestingly, the authors identified stepmouth formation and the need to pull teeth mostly in horses <20 years of age, while spontaneous tooth loss primarily occurred in horses >20-years-old and increased in frequency with age. In contrast to these age-dependent changes, distribution of hook formation and wavemouth was independent of age.¹³ As expected, wavemouth and stepmouth forma-

Figure 1: Dental abnormalities in a geriatric horse (post-mortem specimen). Notice wavemouth formation of the mandibular arcade (right) and almost complete wear (smooth mouth) of the maxillary teeth (left).



tion occurred primarily at the junction of the 4th premolar (the “youngest” tooth) and the 1st molar (the “oldest” tooth). Another interesting result of this study, which serially evaluated several horses over time, was the finding that wavemouth formation and hooks tended to recur despite correction, especially if re-evaluation occurred >6 months following the initial examination and dental correction.¹³ This lends support to the suggestion that oral examinations should be performed at least twice yearly in aged horses, especially if pathologic findings are noted.

Oral examination

Complete physical examinations should precede dental examinations, especially if sedation is required. Routine blood analysis may also be indicated to evaluate potential underlying diseases such as renal or hepatic dysfunction. Evidence of heart murmurs should prompt further diagnostic investigation of any underlying cardiac disease and may prompt prophylactic antimicrobial treatment in horses undergoing dental correction procedures (eg, extractions).¹⁴ Inexperienced horse owners can be overwhelmed by the extensive examination required prior to dental correction in an aged horse and good communication concerning the value of these tests is required. Another consideration in geriatric horses with chronic lameness and/or joint disease is their ability to remain standing under heavy sedation. Inability to lock legs in extension has been observed in geriatric horses with severe arthritis, especially of the carpal joints.¹⁴ While reducing the sedative dose is frequently recommended in aged horses, some older horses can be fairly refractory to sedative effects and violently resist oral examination. Reversal agents may be considered in horses that remain heavily sedated following completion of dental work or in those with unexpected responses to the chosen sedative. Local anesthesia can also be helpful in increasing patient compliance and reducing the required dose of sedation, if painful conditions are present. In selected cases, general anesthesia may be preferable to prolonged or repeated sedation of aged patients.

A full-mouth speculum and a good light source are required to allow adequate examination of the oral cavity. Care should be taken to avoid overextension of the

temporomandibular joint, since degenerative changes leading to pain may be present in older horses, especially those with chronic dental abnormalities. Radiography and other imaging modalities such as computed tomography can be very helpful in assessing dental disease in horses and should be considered prior to engaging in extensive dental correction.

Dental correction in geriatric horses

General recommendations for the treatment of dental abnormalities should be followed and these are covered in several excellent texts.^{12,14} The ability to eat should always be a primary consideration when performing dental examinations and correction in aged horses. Feed alternatives should be discussed with owners if the horse is no longer able to graze (eg, severe changes in the incisor angle), or adequately chew hay or other roughage.⁴ In horses presented for dental evaluation and found to be in thin body condition, feed changes prior to dental correction should be considered.¹⁴ In their therapeutic approach, veterinarians should be primarily concerned with maintaining occlusion to preserve grinding capacity and should advise owners that complete and “cosmetic” correction of dental abnormalities may compound problems rather than correct them. When performed by an experienced clinician, power floating is generally considered less traumatic than hand floating. In very old horses with severely shortened tooth roots, use of certain equipment such as percussion cutters that apply abrupt pressure to the tooth should be avoided.¹⁴ In aged horses with severe dental disease, especially those with inadequate dental care earlier in life, owners should be advised that several treatments may be required to achieve the desired effect. Aggressive changes in one session should probably be avoided. Further, to avoid dissatisfaction, owners should be made aware that horses may need time to adjust to dental correction and that rapid improvement in body condition cannot always be expected. The institution of feeding changes prior to dental correction can help prevent further weight loss due to added stress and, possibly, to the discomfort associated with dental correction.

Exercise

Exercise capacity in older horses varies widely, similar to experiences in other species. In a recent survey of horse owners, 63% of aged horses still performed some athletic activity, while 10% were still competing; 37% of reported horses (165 horses \geq 20-years-old) were considered “retired.”¹⁶ Similar to findings in aging humans, a decrease in the maximum attainable heart rate and aerobic exercise capacity has been demonstrated in aging horses. There have also been observations of loss in lean muscle mass as well as changes in muscle fiber distribution away from that generally required for aerobic exercise.¹⁷ The effect of changing lung capacity and the potential impact of cumulative lung injury (eg, repeated episodes of heaves) on

pulmonary function in the aging horse have not been evaluated.¹⁷

Regular exercise may improve mobility and counteract the age-dependent decline in cardiopulmonary and musculoskeletal function,¹⁷ and owners should be encouraged to provide some exercise to all aging horses. However, exercise regimens need to be tailored to the horse, since excessive exercise can have detrimental effects. Owners of horses that continue to exercise and compete should further be made aware that the horse's ability to thermoregulate may change with age.^{18,19} Along with a reduced plasma volume and the potential for a decreased thirst response in older horses,¹⁷ these athletes may have difficulty staying hydrated and may be prone to overheating during strenuous exercise (eg, endurance racing). Another practical aspect of caring for the aging athlete is the need to adjust or change the saddle and tack to ensure optimum fit as the body undergoes the physical changes of aging.²⁰

Musculoskeletal disease is probably the most important cause of reduced athletic capacity in aged horses, with laminitis and degenerative joint disease occurring most frequently. Musculoskeletal problems in aged horses often result from cumulative wear and tear after years of athletic activity rather than being acute conditions.²¹ Decreased range of joint motion is also frequently observed in aged horses and may further exacerbate lameness problems in horses asked to perform strenuous exercise.²¹ The effect of age-related changes in body conformation, such as the development of lordosis (swayback) on athletic capacity and pain is less well understood,²¹ but should be taken into account when assessing a horse for lameness or decreased performance. Many musculoskeletal conditions in aged patients cannot be cured; rather, they require long-term management and pain control by systemic medication and/or joint injection, as well, trimming and shoeing practices gain special importance. Nonsteroidal anti-inflammatory drugs (NSAIDs) remain the mainstay of pain control in horses and, despite the risk of side effects (eg, gastrointestinal ulceration), can often be used for prolonged periods of time. Horses receiving NSAIDs for extended periods should be placed on the lowest effective dose and monitored for drug toxicity.²¹ This may include checking the mucous membranes for any evidence of ulceration, and performing regular serum chemistry profiles and urinalyses to check for hypoproteinemia, increased liver enzymes, and proteinuria or urine casts. Efforts to develop newer NSAIDs are underway to increase the safety of these drugs for use in horses dependent on maintenance treatment.

Supplements may have a place in managing geriatric horses with chronic joint pain to maintain their mobility. Research has focused on evaluations of glucosamine and/or hyaluronic acid supplementation and there are many commercially available products. Chronic use has not been associated with negative side effects; however, efficacy will likely vary among horses and will depend on the disease stage when treatment is initiated. Encouragingly,

research in human patients has demonstrated improved comfort and range of motion in patients receiving oral joint supplementation.^{21,22} Depending on the location of affected joints as well as the intended use of the horse, arthrodesis can be considered to alleviate chronic pain. This has proven especially successful in low-motion joints such as pastern and lower hock joints, but may apply to other joints in a patient no longer involved in athletic activity. In addition, several authors have proposed the use of complementary therapies including acupuncture, chiropractic, and homeopathy in geriatric horses suffering from musculoskeletal disease and chronic pain.^{23,24} This author lacks the expertise to apply these methods to equine medicine and the interested reader is referred to the cited texts for further information.

Immunology/preventive care/vaccinations

An important issue that has not been investigated sufficiently to date is the adjustment of routine preventive measures such as vaccination and deworming strategies for geriatric horses. Many infectious diseases (eg, strangles) primarily affect younger horses and cumulative immunity due to repeated exposure may occur throughout a horse's lifetime. Nevertheless, geriatric horses may be more susceptible to infections based on declining immune responses with age, concurrent diseases (eg, pituitary dysfunction), general debilitation, and poor nutritional status. It has been demonstrated that declining immune responses with age primarily affect the adaptive immune responses, specifically antibody formation,²⁵ while the innate immune system remains relatively stable throughout life.²⁶ The changing cytokine response in older patients may favour viral infections, such that routine vaccination against diseases such as influenza should continue throughout life.²⁶ No further changes should be made in vaccinating against potentially life-threatening conditions such as encephalomyelitis, tetanus, and rabies.²⁶ In contrast, vaccination against Equine Herpes Virus infection in older horses is not recommended by some authors, since it may provide little benefit and may indeed favour reactivation of latent infections.²⁶ Generally, inactivated vaccines are thought to be safer for geriatric horses compared with attenuated live vaccines.²⁶ Importantly, decreased immune response to vaccination in the face of concurrent conditions such as chronic parasitism has been demonstrated;²⁷ therefore, optimization of a horse's overall health status can aid in achieving the maximum benefit from vaccination.

Deworming strategies should be reviewed in geriatric horses, especially those with perceived loss of body weight and/or condition. Chronic parasitism is perceived as a common problem in aged horses,^{4,10} and can significantly impact general health and the immune response. Chronic parasitism may be of special relevance in horses with pituitary dysfunction. While the literature lacks specific recommendations, regular examinations of body weight, body condition, and fecal egg counts provide easy and affordable measures to monitor parasite load in a geriatric horse.

Summary

Veterinarians may encounter more frequent requests for advice on the medical care and management of geriatric horses. Primary management concerns are maintenance of appropriate body weight through adequate feeding practices and regular dental care, exercise programs tailored to the individual horse, and management of chronic conditions such as osteoarthritis. Several newer textbooks and publications address issues specific to the geriatric horse and more information will likely be forthcoming in the future.

References

1. *Part I: Baseline reference of 1998 equine health and management*. Washington DC: USDA/APHIS; 1998: 7,9,12,21,44-46.
2. Brosnahan MM, Paradis MR. Demographic and clinical characteristics of geriatric horses: 467 cases (1989-1999). *J Am Vet Med Assoc* 2003;223(1): 93-8.
3. Harper F. The geriatric horse. *Large Animal Vet* 1992;47(6):10-12.
4. Jarvis N. Clinical management of the geriatric horse and pony. *Equine Pract* 2003;6:350-355.
5. Lewis LD. *Feeding and Care of the Horse*. 2nd ed. Baltimore, Md: Williams & Wilkins; 1996.
6. Body Conditioning Scoring systems; for example: [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex4830](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex4830). Accessed: May 16, 2007.
7. Pugh DG. Feeding the geriatric horse. In: Proceedings of the 48th Annual Convention of the American Association of Equine Practitioners. Orlando, Florida. December 4-8, 2002. *Proceed AAEP* 2002;48:21-23.
8. Ralston SL, Squires EL, Nockels CF. Digestion in the aged horse. *Equine Vet Sci* 1989;9:203-205.
9. Ralston SL, Naylor JM. Feeding sick horses. In: Naylor JM, Ralston SL, eds. *Large Animal Clinical Nutrition*. St. Louis, Mo: Mosby Yearbook; 1991:438-439.
10. Ralston SL. How I treat chronic weight loss in geriatric horses. *Comp Cont Ed Pract Vet* 1999;21:655-658.
11. Schott HC. Obstructive diseases of the urinary tract. In: Reed SM, Bayly WM, Sellon DC, eds. *Equine Internal Medicine*. 2nd ed. St. Louis, Mo: Saunders; 2004: 1259-1270.
12. Graham BP. Dental care in the older horse. *Vet Clin North Am Equine Pract* 2002;18:509-522.
13. Hübner H, Hertsch B. Changes of the cheek teeth in old warmblooded horses (>15 years) and in other equines. *Prakt Tierarzt* 2006;87(4):276-282.
14. Wilewski K, Basile T, Pence P. Geriatric horse dentistry. In: Pence P ed. *Equine Dentistry: A Practical Guide*. Philadelphia, Pa: Lippincott, Williams & Wilkins; 2002:169-189.
15. Baker GJ, Chandler KJ. Dentistry in the geriatric horse. In: Bertone J. ed. *Equine Geriatric Medicine and Surgery*. St. Louis, Mo: Elsevier; 2006: 51-58.
16. Brosnahan MM, Paradis MR. Assessment of clinical characteristics, management practices, and activities of geriatric horses. *J Am Vet Med Assoc* 2003; 223:99-103.
17. McKeever KH. Aging and how it affects the response to exercise in the horse. In: Bertone J. ed. *Equine Geriatric Medicine and Surgery*. St. Louis, Mo: Elsevier; 2006: 69-78.
18. McKeever KH. Exercise physiology of the older horse. *Vet Clin North Am Eq Pract* 2002;18:469-490.
19. McKeever KH, Eaton TL, et al. Thermoregulation in old and young horses during exercise. *Med Sci Sports Exerc* 2000;32:S156.
20. Loving NS. Field approach and wellness management of geriatric horses. In: Bertone J. ed. *Equine Geriatric Medicine and Surgery*. St. Louis, Mo: Elsevier; 2006:11-24.
21. Cary J, Turner T. Geriatric musculoskeletal disorders of the horse. In: Bertone J. ed. *Equine Geriatric Medicine and Surgery*. St. Louis, Mo: Elsevier; 2006:135-145.

22. McIlwraith CW. Diseases of joints, tendons, ligaments, and related structures. In: Stashak TS. ed. *Adam's Lameness In Horses*. 5th ed. Philadelphia, Pa: Lippincott, Williams & Wilkins; 2002:511-516.
23. Kenney JD, McCormick WH. Manual therapy, acupuncture, and Chinese herbal medicine in the geriatric equine. In: Bertone J. ed. *Equine Geriatric Medicine and Surgery*. St. Louis, Mo: Elsevier; 2006:79-105.
24. Boldt E. Use of complementary veterinary medicine in the geriatric horse. *Vet Clin North Am Eq Pract* 2002;18:631-636.
25. Klinman NR, Kline GH. The B-cell biology of aging. *Immunol Rev* 1997; 160:103-114.
26. Fermaglich DH, Horohov DW. The effect of aging on immune responses. *Vet Clin North Am Eq Pract* 2002;18:621-630.
27. Edmonds JD, Horohov DW, Chapmat MR, et al. Altered immune responses to a heterologous protein in ponies with heavy gastrointestinal parasite burdens. *Equine Vet J* 2001;33:658-664.

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Website: <http://www.aabp.org/>

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Dr. Lohmann has stated she has no disclosures to announce in association with the contents of this issue.

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This publication is made possible by an educational grant from

Schering-Plough Canada Inc.

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