

Health problems in geriatric horses

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Summary

Geriatric horses, like other animals (and humans), suffer from various diseases called old-age diseases. This publication has been developed in response to the needs of owners and caretakers of a growing number of geriatric horses. Since the horse has a long life span, the geriatric stage can encompass up to 1/3 of the animal's lifetime and can quite often last more than 10 years. This paper aims at systematizing the information of the most prevalent geriatric diseases in horses which inhibit their performance and considerably lower their quality of life. Knowledge of these diseases can help to avoid mistakes when keeping and managing such horses and may provide guidelines for maintaining welfare and preventive treatments. This article reviews the most prevalent old age health problems, their origin, diagnostics, course and effects for the body. Information about the most common diseases of old age in horses is found in 119 references. The nine sub-chapters include the diseases of the digestive system, especially the oral cavity, the stomach and bowels' diseases, the respiratory system, the cardiovascular system, dysfunctions of the locomotor system, eye diseases, endocrine and neuroendocrine diseases as well as the immune system, neoplasms and general body condition. It should be emphasized that there is the possibility to maintain the well-being of geriatric horses through progress in veterinary medicine and sharing knowledge of equine functioning and health protection. Preventive health care should include regular blood testing, regular dental check-ups and adequate nutrition adapted to the overall condition, dental condition, physical activity and comorbidities. Adequate individual supplementation recommended by a nutrition specialist and a veterinarian is also essential.

Keywords: horse, old age diseases, geriatric problems

The growing number of geriatric horses in the horse population is due to the perception of the horse as an animal accompanying humankind throughout the horse's lifetime (34, 39, 40). Increasingly, owners are trying to provide their older horses with a decent retirement, take care of their physical and mental condition and ensure the best possible welfare (7, 74). Horses (*Equus caballus*) are long-living animals and the geriatric stage can encompass up to 1/3 of their lifetime, quite often lasting more than 10 years. This fact, when considered together with sentimental and economic aspects, calls for a search for alternative forms of keeping older horses in the best possible condition (37, 89). The definition of a geriatric horse is ambiguous, although it most frequently denotes a very old animal, above 20 years of age, suffering from old age diseases (4, 37). This often makes it impossible for

such horses to function normally and to be used (4, 34). Even in healthy animals, the ageing process inevitably leads to numerous undesirable changes which occur in the body (11, 67) and most often cover dysfunctions of the locomotor system, diseases of the respiratory and digestive systems, muscle mass reduction, deteriorating eyesight and hearing or hormonal diseases. Some changes, e.g. PPID (Pituitary Pars Intermedia Dysfunction), can be considered an individual problem which, in older horses, additionally adversely affects daily functioning (11, 39).

Unfortunately, in practice older horses are provided with less veterinary assistance than young individuals because they are not considered fully fit and productive (41). This is due to the perception of diseases as the natural consequences of the ageing process (40, 41, 67). It has been observed that the owners of geriatric horses

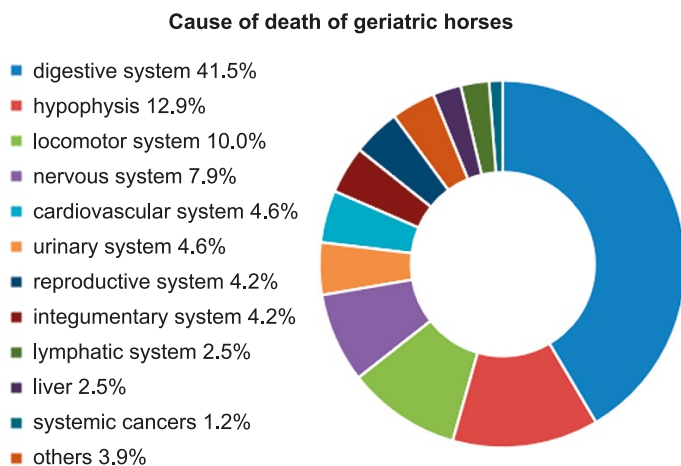


Fig. 1. Cause of death among geriatric horses (according to Miller et al. (83))

are hardly concerned about the regular application of basic nursing practices in older individuals and almost 30% of the animals examined were not provided with any veterinary assistance (41). The passive attitude of horse owners in terms of treating and preventing diseases is due to the wide spectrum and common occurrence of health problems in old individuals (39). Based on interviews and surveys it can be concluded that knowledge of factors affecting animal health and functioning as well as upkeep methods, nutrition, preventive healthcare and treatment is insufficient (40).

This review aims to systematize information on the most prevalent diseases in geriatric horses which inhibit their functioning, thus considerably limiting their quality of life.

The most frequent problems

Based on a review of the post-mortem examination results which covered 241 horses aged 15-20 years and above 20 years of age, eleven causes of natural death or euthanasia were reviewed (Fig. 1) (59).

The pathological alterations of the nervous system were more frequent in the age group from 15 to 19 years; the diseases of the digestive or urinary tracts, however, concerned mostly horses above 20 years of age. Systemic neoplasmas, cancers of various organs have resulted in exitus or euthanasia in 18.7% of all observed horses. Squamous cell carcinoma, lymphoma and melanoma were considered the most frequent malignant tumors.

The most common ageing diseases in horses are described in following subsections.

Digestive system disturbances

Nutritional problems (and the control of body weight) require special attention in geriatric horses, even though old-age changes are mostly due to decreasing protein and fiber digestion. Nutritional problems show various origins, e.g. dental deficiencies, nutrient digestibility problems and kidney or liver failure (4, 5). Nevertheless, each problem is related to reduced feed

uptake or a more difficult digestibility of nutrients, leading to body muscle mass decrease (79, 87).

Upon the occurrence of both liver and kidney failure, nutrition is based on an adequately balanced and easily digestible diet with limited amounts of some nutrients (e.g. phosphorus and calcium, some aromatic amino acids) and control of the protein level in the feed administered to prevent excessive load on those organs (45, 79). Administering the right amount of protein to the animal, not exceeding the daily reference value, minimalizes metabolism through the liver, which, as a result, maximizes organ regeneration capacity. Old-age failure of organs related to low activity, which slows down the metabolism with catabolic processes prevailing over anabolic processes, finally leads to the accumulation of adipose tissue at the expense of muscle tissue (4, 52, 79). The final effect is bodyweight loss which is an unavoidable consequence of ageing. As for young horses with full vitality, the skeletal muscles can account for as much as 40% of the whole body weight using up to 60% of the energy resources produced by the body (73). In older individuals, energy requirements decrease as a result of a reduction in muscle mass, namely sarcopenia. The decrease in muscle mass in horses can be due to changes in intestine microbiota, which can result in the occurrence of bowel disorders. These disorders can lead to the occurrence of PLO (Pedunculated Lipoma Obstruction), which can cause diarrhea or colic manifestations, often requiring surgical intervention (22, 77).

Oral cavity diseases and disturbances. The prevention of dental diseases in horses is an essential element of attentiveness to their welfare (19). In the natural ageing process, stomatological problems in Equidae will occur as standard and quite often they can be very painful (56, 75, 86). In horses above 15 years of age in as many as 96% of cases, various dental problems are diagnosed (63). The factors significantly affecting the functionality and “vitality” of the tooth include the age of the animal, long-term dental treatments, a lack of regular rasping or too frequent tooth rasping, as well as the type of diet applied (43).

In older horses, the most frequent problems concern the displacement of teeth or a ring angle of dental abrasion. This is due to the fact that, with age, the teeth become much smaller and incisors become oval in shape, increasing the gaps (the so-called ‘old-age diastema’) between the cheek teeth (78). Diastema is frequently associated with periodontium diseases. Inadequate tooth abrasion is, in turn, due to uneven use of the tooth structure. Due to its hypsodontic nature, the occlusion surface is not built of tooth enamel only, like in humans, but also of cement and dentin (83). Varied use across those three components leads to the formation of sharp ridges on the chewing surface, additionally reducing tooth resistance to abrasion and thus making chewing difficult (25). The uneven abrasion triggers a change in the so-called occlusive

contact, with an incorrect location of the upper jaw against the lower jaw (71). This happens since, unlike the jaw teeth, with time the teeth on the mandible cheek become more rounded and do not align with the maxilla teeth. With age, the incisors also change their length and the angle, thus becoming sharper and hurting the cheeks in animals while chewing (48). Additionally, problems with food chewing can lead to esophageal obstruction, bodyweight loss or colic (26). In horses above 15 years of age, a frequent dental problem is the EORTH syndrome (Equine Odontoclastic Tooth Resorption and Hypercementosis), which involves the hypercementosis of the incisor roots and odontoclastic tooth resorption (71). A diseased animal suffers from a loss of appetite and severe pain when uptaking food and chewing. Fortunately, the equine apical infections of the tooth are sporadic in horses, although when untreated they can lead to periostitis of the jaws, sinusitis, head swelling or fistulas (19).

Stomach and further parts of the digestive tract problems. It has been proven that some of the more frequent causes of natural death or euthanasia are digestive tract conditions, including gastric ulcers (12, 70). They can trigger further digestive tract dysfunctions, a loss of appetite and related emaciation, colic and a general deterioration of geriatric horse welfare. Peptic ulcer disease in horses may show no pathognomonic syndromes, although decreased appetite, emaciation, poor utilization of the feed consumed, recurring colic, laminitis, diarrhea, aggression or an unwillingness to cooperate with humans may occur (21).

In older horses (> 19 years of age) the relations between its own cells and microorganisms living in the body (microbiota), which play the key role in digestion and in the correct functioning of the defence system, often result in disorders. As a result, the digestibility of the feed consumed is reduced and the incidence of colic, colitis and susceptibility to infections, which are related to the lowered immunity, increases.

Older horses, over 17 years of age often develop lipomas, which are benign tumors (28, 69). They are formed within the mesentery, which can cause intestinal ischemia, bowel necrosis and volvulus.

Respiratory system disorders

In ageing, respiratory capacity decreases, which is related to marked physical weakness. The risk of the occurrence of a series of respiratory disorders (which

come second after lameness) also increases with age (40, 69). However, although respiratory conditions in older horses are frequent, they generally rarely become a cause of animal euthanasia (69). Nevertheless, in the case of respiratory problems immediate intervention by a veterinary surgeon is necessary as reoccurring or chronic conditions can eventually lead to irreversible structural changes in the respiratory organs (16, 57). Despite the conditions which lead to anatomic changes in the lungs, larynx diseases can occur as well (16). As a result, several chronic diseases can occur, especially chronic obstructive pulmonary diseases or chronic degenerative changes in the course of IADs (Inflammatory Airway Diseases) or pneumonia and neoplasmas, which exclude the horses from any use (72, 90).

Despite the conditions which lead to anatomic changes in the lungs, larynx diseases, IADs or pneumonia can occur as well (16). Asthma syndrome in horses, earlier referred to as RAO (Recurrent Airway Obstruction) (11), the first symptoms of which are most often manifested in horses at the age of 7-8 years, in its most severe course is observed in older horses > 16 years of age. As a result of many years of exposure to allergens and often in inadequately treated horses, it can cause chronic inflammatory changes in lung tissue and its calcification, which hinders starting an effective therapy and frequently makes it impossible. Such animals are excluded from use and, in extreme cases of cardiorespiratory failure, are destined to be euthanized (90). Asthma in horses is triggered by the reaction of the body to allergens mostly found in straw or hay (42, 72). This is seen in the respiratory tract inflammation or hyperreactivity of the respiratory tract (bronchospasm), as well as, in some cases, leading to airway remodeling (42). Symptoms mostly include a frequent cough and runny nose due to an excessive accumulation of mucus in the airways, as well as difficulty in breathing, higher resting heart rate and lower respiratory capacity (14, 16).

Even though IAD occurs in horses of any age, geriatric horses, especially those diagnosed with PPID, show a higher susceptibility to respiratory tract infection due to an immunodeficiency (57). IAD occurs mostly due to bacterial infections as well as due to the hyperactivity of molds and pollens in the environment (3). In the case of IAD, slightly less severe symptoms of the asthma syndrome are observed than in the case of

Tab. 1. Comparison of asthma (formerly recurrent airway obstruction, RAO) and inflammatory airway disease (IAD) (63)

	Asthma (formerly RAO)	IAD
Signalment	Older (> 7 years old)	Any age, including young racehorses
Clinical signs	Increased rate and depth breathing	Absence of change in rate, depth or pattern of breathing
Radiographic features	Variable bronchointestinal pattern	Less severe bronchointestinal changes, less air trapping
BAL and tracheal cytology	Marked neutrophilia (> 25%), in remission normal	Fewer inflammatory cells in BAL fluid. Mild neutrophilia, lymphocytosis and monocytosis
Response to environmental control	Good	Variable to poor

RAO. Since, in many cases, they may only be limited to lower exercise tolerance, at the initial stage they are sometimes ignored (or even missed) by the owners. Typical clinical IAD symptoms in horses include increased production of mucus, resulting in a runny nose, cough and breathing difficulties. Comparison of asthma (formerly RAO) and inflammatory airway disease (IAD) are presented in Table 1.

In the treatment of respiratory conditions, mostly in the case of asthma, corticosteroid therapy and other preparations are used to limit the inflammation and bronchial spasm. However, it should be noted that the application of glucocorticosteroids in older horses, especially those suspected of PPID, can result in laminitis (46).

Cardiovascular system disorders

In geriatric horses, many cardiological diseases also occur (53, 57). However, typical age-related conditions include valvular heart diseases and congestive cardiac failure. Aortic ruptures, aortic aneurisms and cardiac fibrosis are less frequent. Heart disease can also result from complications following lung diseases (10).

The moment of the occurrence of valvular heart disease defects in degenerative cardiovascular diseases is difficult to determine (3). Such diseases can develop over a few days, immediately after endocarditis or over a longer period, due to non-inflammatory blood circulation changes. In the course of that condition, changes in the collagen structure in valves followed by chordae tendineae degenerations occur. These changes make valve closing impaired, causing heart failure with audible murmurs. In warmbloods, such changes most often concern the aortic valve and mitral (bicuspid) valve, as higher blood pressure in the left half of the heart is conducive to the occurrence of those changes (57, 84). Mitral insufficiency shows, for example, a considerable decrease in the condition of the animal, a prolonged time of the heart rate resuming resting values after exercise, an increased heartbeat and number of breaths, coughing, excessive perspiration and exercise intolerance. Aortic valve insufficiency, however, is considered a natural effect of the animal ageing process. As a result, these changes may lead to congestive heart failure.

Congestive heart failure occurs as acute or chronic heart failure, and it is caused by advanced valve insufficiency, which leads to left atrial enlargement (84). The consequence can be pulmonary hypertension and further pulmonary edema (17). A symptom of congestive heart failure is mostly an increased heartbeat and number of breaths at rest, as well as audible heart and lung murmurs. Left atrial enlargement may also lead to the occurrence of atrial fibrillation. It can also result from congestive heart failure caused by the malfunctioning of other systems, which may appear weeks before heart failure.

Locomotor system

Musculoskeletal disorders, along with gastrointestinal disorders and airway disorders, are a common problem in geriatric horses (13, 39). Quite frequently they disqualify old animals from any use (38, 39, 88). According to Beard (8), a wide spectrum of the occurrence of such conditions is confirmed by the common trend of administering nonsteroidal anti-inflammatory drugs which relieve pain causing lameness in older horses. It should be noted, however, that excessive administration of such medications can increase the risk of incidence of gastric ulcers. Pain relief allows the animal freer mobility at the cost of the condition worsening. Severe incurable lameness then becomes a frequent cause of euthanasia in animals (8, 13, 40). Lameness shows an irregular or asymmetrical gait caused by the pain suffered, which in older horses may be due to joint effusion resulting from mechanical damage to the joint or changes in the structure of the cartilage (39). Joint cartilage is the basic structural material of the joint, which itself is nerveless, although the other elements of the joint are very well innervated with numerous receptors (88). During the inflammation, the receptors become more sensitive to the effect of thermal, chemical and mechanical stimuli and then to intensified joint pain symptoms. In geriatric horses, most damage to the joint is often a result of an intensive sports career related to physical overloads or it is a consequence of numerous injuries (88). A consequence of such a condition includes diseases, especially arthritis, osteoporosis, osteoarthritis, sesamoid degeneration, hoof cartilage calcifications, tendon mineralization and limb ruptures or fractures.

With age, tissue regeneration capacity is also reduced, which increases the risk of weakened ligaments and tendons, thus increasing the possibility of very serious injury. For this reason, older horses are more often susceptible to tearing or inflammation within those structures, which excludes them from use (88). When assessing lameness in geriatric horses, past chronic laminitis and the problems of the region of the hoof capsule should be noted; e.g. white line disease, hoof rupture, or a convex sole (<https://magwet.pl/25359,choroby-serca-i-ukladu-krazenia-u-starych-koni> (shared 5 Feb. 2020), 64). Furthermore, such conditions are often intensified with laminitis (88). Many-year irregular or inadequate hoof shoeing and trimming also affects the condition of the tissues within the hoof.

Eye diseases and conditions

Several studies have determined that the incidence of eye problems accounts for 3.9-8% of the population of geriatric horses (15, 35, 37). However, this number increases with age to reach the level of 20% of the horse population above the age of 30 years (40). Eye conditions result in considerable difficulties in the use

of animals. Blind horses or horses with a narrowed visual field can show great anxiety and fear, which can result in their elimination from use as saddle horses. Additionally, such animals require daily specialist care, which may involve additional work (24).

During the ageing process, changes affecting the eyeball surface occur and the activity of the lacrimal gland decreases (29). The risk of the occurrence of dry eye syndrome, even though quite rare in horses, increases with age. This is the case despite the fact that no difference has been found between the amount of tears produced in old and young horses (70). The dry eye syndrome can be caused by immune lymphocytic-plasmacytic infiltration in the lacrimal gland as well as contagious diseases, endocrine disorders and iatrogenic effects. Dry eye syndrome shows a greenish-yellow exudate, which is often mistaken for bacterial infection. The disease when untreated can lead to corneal ulceration and even to perforation of the eyeball.

It should be stressed that bodyweight loss, especially of adipose tissue, can change the composition of the tear film, thus lowering the content of proteins with antibacterial and bactericidal properties (lactoferrin and lysozyme) forming the bactericidal barrier of the eye (9, 18, 29). Bodyweight loss is accompanied by enophthalmos, i.e. the posterior displacement of the eyeball within the orbit (32).

As mentioned earlier, the eye surface can be affected by a poorer immunological response (55). An impaired function of lymphocytes T and a reduced phagocytic activity of polymorphonuclear lymphocytes can increase the incidence of equine contagious diseases (55, 70). Superficial ulcerative keratitis is a frequent condition among horses (55). Although the condition can occur in horses of any age, it is considered that older horses are most susceptible to it (29, 51, 68). In all likelihood the epithelial basement membrane of the anterior part of the cornea becomes thicker with age, delaying its healing considerably. The cornea is a densely innervated body tissue built of keratocytes (among other things) whose density decreases with age (29). The nerve fibers stimulate the corneal epithelium, causing growth, proliferation and epithelial cell differentiation, as well as the production of type VII collagen (70). Decreased corneal sensory innervation causes ulceration and epithelial defects of the eye. More cases of corneal ulceration have been noted in horses also suffering from PPID (55, 70). With age, the number and density of corneal endothelium cells protecting the hydrophilic stroma of cornea against the penetration of the fluid from the anterior chamber of the eyeball also decreases (29, 30). The loss of those cells leads to corneal edema – dystrophy and a loss of corneal transparency (70).

Endocrinological and neuroendocrine disorders

Disorders of the endocrine system in geriatric horses are mostly associated with PPID (70). This disease is

often identified with Equine Cushing Syndrome (ECS) and is due to the very high probability of endocrine disorder caused by an increased concentration of, for example, acetylcholine (ACh) in the plasma (40, 54). The key problem is neurodegeneration, inhibiting the effect of dopaminergic hormones of the hypothalamus, leading to the occurrence of micro- and macro-adenoma (23). In diseased individuals, polyuria or polydipsia, changeable appetite, decreased fitness, hirsutism or deteriorated hair quality, laminitis, excessive sweating or an uneven accumulation of the adipose tissue are most common (60). The common clinical picture of the disease is, however, much milder, mostly with a sunken dorsal line, apathy and lower physical performance of the body. It is also often accompanied by changes in body posture and hoof deformation (23, 65). Generally, in geriatric horses suffering from PPID, ageing-related problems also become more severe.

From the immunological point of view, ECS can inhibit neutrophils functioning, decrease immunity and increase the incidence of bacterial diseases, especially equine abscess or sinusitis (58). An immunity reduced due to PPID can also be the cause of pneumonia or eye infections caused by the lack of response to pathogens (57). Such symptoms of chronic laminitis can often be observed in horses with PPID. Donaldson et al. (20) have demonstrated that in older horses with PPID, laminitis is diagnosed much more frequently than in older horses not suffering from that condition. Due to the difficulties in early diagnosis of the disease, equine feces analysis can be useful. Feces in horses with PPID are characterized by a higher count of parasite eggs than in that obtained from healthy individuals. The fecal parasite egg count can facilitate an initial and faster disease diagnosis (23).

EMS (equine metabolic syndrome) is diagnosed based on the symptoms of an uneven accumulation of adipose tissue, especially in the region of the nape, general obesity and present or past laminitis (23). The disease develops mostly as a result of administering feeds with excessive energy value compared with the energy expenditure of the animal. A diet abundant in carbohydrates results in the occurrence of insulin resistance, namely insulin level disorders (47). A high level of insulin prevents the production of glucagon, a hormone responsible for the process of burning calories. This results in energy deposition in a form of adipose tissue, thus leading to overweight or obesity. Upon insulin resistance, hyperinsulinemia (an excessive release of insulin) appears. The task of insulin is to maintain the right level of glucose. However, frequent releases can lead to a further intensification of insulin resistance and, as a result, to laminitis (23). With age and ageing-related reduced physical activity and thus a lower demand for energy, older horses become more susceptible to this disease (27).

Hormonal origin laminitis is mostly caused by PPID and EMS (50). Laminitis is a noncontagious diffuse

inflammation of the lamina of the hoof covering the coffin bone. When triggered by a high level of insulin, it leads to a dangerous basement membrane platelet pathology in the hoof (49). The basement membrane is an epidermal layer of specialized stem cells combined with the connecting tissue of the skin, which constitutes the hoof base medulla. During laminitis, the basement membrane (BM) suffers damage. The coffin bone is then lowered, which can lead to protrusion around the frog, and even to perforation of the sole and further to infection (33). Unfortunately, acute laminitis can even lead to animal death.

Immune system

Changes resulting from the occurrence of the disease known as immunosenescence are similar in both horses and in people (31). Immunosenescence shows a general change in the number of lymphocytes associated with the ageing body. Determining the cause of immunosuppression in ageing horses is quite difficult as one has to differentiate between the changes caused only by the age of the animal from the pathology caused by the disease (60). In horses with immunosenescence, the lymphocyte T (CD45RA) count in blood decreases, which is due to a reduced capacity for cell proliferation (1, 31, 60). Moreover, the amount of glycoprotein CD4 increases and the CD4 to CD8 glycoprotein ratio changes, which is characteristic of a proinflammatory condition in the body. The production of proinflammatory cytokines is then triggered which results in several problems, including obesity (60-62). Besides the low specific immunity, there is also a decrease in innate immunity (80) responsible for protection against pathogens (<https://magwet.pl/25359,choroby-serca-i-ukladu-krazenia-u-starych-koni> (shared 5 Feb. 2020)). In most cases, older horses maintain an immunity level sufficient to protect against pathogens; however, the risk of falling ill with dangerous and fatal contagious diseases is very high in such animals (60). Thus, immunosenescence is also perceived as an indicator of an increase in the risk of mortality mostly among ageing and older horses.

Neoplasms

Cancers in horses, as long as they are not visible on the skin surface, are not diagnosed as often as in humans or accompanying animals. Neoplasms are often found “by accident” or in a post-mortem examination. The most frequent benign tumors in horses include sarcoids manifested in skin changes which can take different shapes and locations, most frequently on the outer side of the femur, in the neck region and the ventral part of the thorax (44). Another most frequently diagnosed of the benign tumors are lipomas, which are not malignant although their location in mesentery can lead to bowel necrosis and, as a result, to death (81).

Malignant tumors most frequently found in horses include melanoma, mostly affecting grey horses,

squamous cell carcinoma, most commonly located in the regions of non-pigmented skin and locations less covered with hair coat, especially the eyes, the region of the muzzle, anus and genitalia (<https://magwet.pl/wpd/24683,zespol-metaboliczny-u-koni-objawy-kliniczne-i-leczenie> (shared 6 Feb. 2020)). The third most regularly diagnosed malignant tumor in horses is lymphoma (6). Lymphomas are generally uncommon in horses, but are considered the most common neoplastic disease of the hemolymphatic system (58).

Another type of cancer is squamous cell carcinoma (SCC). It is a common disease that seriously affects the health and welfare of sick horses (82). The SCC in horses has similar cytological and histopathological features as human tumors caused by the human papillomavirus (hrHPV). Hence, it has been hypothesized that SCC in horses can also be caused by papillomavirus (85).

General condition of the body

Another cause of reduced body weight in horses may be a lack of sufficient uptake of food due to difficulty in grinding and chewing related to teeth problems (4, 45). Older horses also produce considerably lower amounts of saliva, which hinders the optimal processing of the food consumed. Feed administered to horses with dental problems may be too hard and difficult to grind (19, 45). The consumption of feed is often accompanied by pain discouraging any uptake. Due to lower appetite, reduction in saliva production and lower nutrient absorption, geriatric horses need an easily digestible tasty feed with a higher concentration of nutrients. In the nutrition of these horses, haylage, beet pulp, molasses and various types of specialized fodder for senior horses are often used. Unfortunately, the control of body weight in geriatric horses is not easy because weight loss is not the only problem (2). Similar to a muscle mass reduction, excessive obesity in this type of animal can occur. A tendency toward obesity is due to older horses being more susceptible to the risk of infection with pathogens and the occurrence of acute proinflammatory conditions. Excessive obesity and an uneven distribution of the adipose tissue result from an increased amount of cytokines created through the inflammation (2). Moreover, obese horses demonstrate an increased level of lymphocytes and monocytes producing inflammatory cytokines.

Preventive healthcare

The preventive healthcare of geriatric conditions in horses should include regular morphological and biochemical blood tests, body condition score (BCS), fecal samples, gait examinations, regular dental check-ups and nutrition adequate for general fitness, teeth condition, physical activity and comorbidities (40). Similarly, an adequate supplementation given to

a horse in cooperation with a nutrition specialist and a veterinary surgeon is also important.

Moreover, geriatric horses are generally less excitable, less interested in their surroundings, have trouble concentrating, and are more apathetic (89). Therefore, the mental condition of geriatric horses should be taken care of and they should be provided with free daily movement in the fresh air, the company of other horses and careful care.

Despite lethal cases or the necessary euthanasia of geriatric horses, some older horses remain sufficiently healthy to be used as saddle horses or for animal-assisted therapy activities (64, 66). It is important that the animals are valued for their peaceful nature and long experience in the saddle. As for older horses, each successive year (and even month) of life has a considerable effect on the horse's fitness for use (66). However, even very old individuals, i.e. more than thirty-year-old horses, can do a little work in horse-riding schools, which most often maintains their correct mental and physical condition (76). Irrespective of their fitness for use, it is necessary to maintain the welfare of older horses. Such actions are becoming increasingly feasible thanks to the considerable development of horse geriatric medicine as well as sharing knowledge of preventive healthcare in horses during the final years of their life (13, 36).

The aim is to maintain a mental and physical balance of geriatric horses to ensure their long life without compromising their welfare in any of its aspects. The lack of diagnoses of the conditions typically found in geriatric horses can constitute a barrier to providing those animals with adequate care. The common occurrence of diseases in older horses and numerous factors which cause such diseases call for horse caretakers and owners to acquire the knowledge and to provide the care required by geriatric horses to allow the animals to enjoy a peaceful old age for many years.

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