Veterinary medicine and canine aging: general aspects of the identification and treatment of major diseases in geriatric dogs

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Recibido: 27/05/2025 Aprobado: 05/12/2025

ABSTRACT

Life expectancy in dogs has increased due to advances in veterinary medicine, making the systematic monitoring of senior animals essential. This article presents a narrative literature review conducted between July and November 2025 using the PubMed, SciELO, and ScienceDirect databases, including publications from 2020 to 2025 that address physiological, clinical, and therapeutic aspects of geriatric dogs, with emphasis on studies from South America, North America, and Europe. The review describes criteria for age classification, physiological changes associated with aging, and the main conditions affecting this population, such as osteoarticular, renal, endocrine, cognitive, and neoplastic diseases. The literature highlights the importance of early identification of these alterations and the role of owners in adherence to care. The objective of this article is to synthesize current knowledge on the most prevalent diseases in elderly dogs and to present evidence-based measures that support adequate monitoring and management.

Keywords: dogs, treatments, aging, pathologies.

Medicina veterinária e o envelhecimento canino: aspectos gerais da identificação e tratamento das principais doenças em cães idosos

RESUMO

A expectativa de vida dos cães tem aumentado em razão dos avanços da medicina veterinária, tornando essencial o acompanhamento sistemático da saúde de animais idosos. Este artigo apresenta uma revisão narrativa de literatura conduzida entre julho e novembro de 2025 nas bases PubMed, SciELO, e ScienceDirect, incluindo publicações de 2020 a 2025 que abordam aspectos fisiológicos, clínicos e terapêuticos de cães geriátricos, com ênfase em estudos da América do Sul, América do Norte e Europa. A revisão descreve critérios de classificação etária, alterações fisiológicas associadas ao envelhecimento e as principais condições que acometem essa população, como doenças osteoarticulares, renais, endócrinas, cognitivas e neoplásicas. A literatura destaca a importância da identificação precoce dessas alterações e do papel dos tutores na adesão ao cuidado. O objetivo deste artigo é sintetizar o conhecimento atual sobre as doenças mais prevalentes em cães idosos e apresentar medidas baseadas em evidências que auxiliem no monitoramento e manejo adequados.

Palavras chave: cães; tratamentos; velhice; patologias.

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INTRODUCTION

Aging is an inevitable biological process that affects all mammalian species, including dogs, and is associated with progressive and cumulative changes that impact organ systems, behavior, and functional capacity. Over recent decades, advances in preventive, diagnostic, and therapeutic veterinary medicine have contributed significantly to the increased life expectancy of companion animals, which, in turn, has expanded the population of senior dogs and introduced new clinical challenges. With this growing demographic shift, it becomes essential to develop a comprehensive understanding of the physiological changes inherent to senescence and to recognize, at an early stage, the most frequent diseases occurring during this phase of life.

Although there is a substantial body of knowledge on veterinary geriatrics, important gaps remain regarding the standardized definition of what constitutes "old age" in dogs, the criteria used for this classification, and the differences among breeds, sizes, and individuals. Furthermore, many conditions typical of senescence such as neurological, cardiovascular, renal, osteoarticular, metabolic, behavioral, and sensory disorders exhibit slow progression and nonspecific early signs, which hinders early diagnosis and, consequently, the establishment of effective intervention strategies.

Given this context, it becomes necessary to compile and systematize updated information that may assist both veterinarians and owners in understanding this stage of life. Thus, the present study aims to deepen knowledge on canine aging by addressing the definition of the geriatric stage, the classification criteria, the main physiological changes associated with advancing age, and the most prevalent health problems in elderly dogs. Additionally, it compiles evidence on diagnostic approaches, therapeutic options, and preventive strategies, with the purpose of supporting veterinary clinical practice, guiding evidence-based decision-making, and promoting owner awareness regarding the importance of regular monitoring, specific care, and early intervention. In this way, the study seeks to contribute to the maintenance of health, welfare, and quality of life in this growing population of elderly dogs.

THE IMPORTANCE OF IDENTIFYING ABNORMALITIES

Animals of advanced age frequently develop physiological alterations resulting from the natural wear of the organism. In this context, the early identification of potential abnormalities becomes essential, as such conditions directly affect both quality of life and life expectancy. Therefore, regular veterinary monitoring is of utmost importance. Technological advances in veterinary medicine have enabled increasingly accurate diagnoses, as well as the adoption of more effective therapies. These innovations not only promote improved quality of life but also contribute to the development of therapeutic strategies capable of mitigating the effects of aging and extending the lifespan of animals, always with an emphasis on the promotion of welfare.

DEFINITION OF OLD AGE

Determining the point at which a dog can be considered elderly is influenced by several factors, among which body size and breed are particularly relevant (Montoya *et al.*, 2024). In general, large-breed dogs tend to experience aging earlier than small-breed dogs. The age range marking the onset of

canine senescence typically lies between seven and fourteen years. Specifically, small-breed dogs are considered elderly from 11 years of age, medium-breed dogs from 10 years, and large-breed dogs from 9 years, as illustrated in Supplementary Figure 1. In addition to chronological age, certain clinical and behavioral signs can assist in identifying aging. Among these are coat changes (particularly the appearance of gray hairs around the eyes and muzzle) thickening of the paw pads, tooth loss, reduced mobility, lethargy, and diminished visual and auditory capacities (Vajányi *et al.*, 2024).

NATURAL AGING AND EXPECTED CHANGES

Aging is an inevitable physiological phenomenon, and its rate and manifestations vary among individuals. While some animals develop cardiac diseases, others may present renal, respiratory, or other systemic dysfunctions (Dias-Pereira, 2022). Metabolic changes are particularly common at this stage of life, largely due to reduced cellular turnover, which compromises tissue regeneration and, consequently, the optimal functioning of organs. Among the most frequently observed changes, the following stand out:

- **Weight fluctuations:** A reduction in caloric requirements is common, accompanied by the need for a diet enriched with antioxidants, vitamins, and amino acids (Key, 2024). Body weight control becomes essential, as a decelerated metabolism may favor the development of obesity.
- **Nutritional adjustment:** It is recommended to replace the habitual diet with formulations specifically designed for senior dogs, which provide an appropriate nutrient profile for this life stage (Laflamme, 2024). The amount offered should always follow veterinary guidance.
- **Evident physical changes:** These changes include the appearance of whitish hairs around the muzzle and eyes, calluses on the elbows, fragile nails, thickening of the footpads, reduced mobility due to joint wear, and loss of lean muscle mass (Laflamme, 2024).
- **Sensory impairment:** The progressive decline of vision and hearing may hinder the animal's interaction with its environment, requiring adaptations from owners.
- **Systemic dysfunctions:** These include urinary incontinence, decreased renal and cardiac function, and increased susceptibility to the progression of periodontal diseases, such as gingivitis, periodontitis, and tartar accumulation (Olin *et al.*, 2024).

It is important to highlight that these changes do not occur uniformly. Factors such as genetic inheritance and individual predispositions directly influence the manifestation and severity of the clinical conditions observed.

ESSENTIAL CARE FOR ELDERLY DOGS

Once a dog's age has been classified, certain precautions must be taken, as many problems may arise and, if not managed appropriately, can worsen the animal's condition. Key recommendations include:

- **Weight control:** Avoid excessive weight fluctuations, which may contribute to the development of various diseases.
- **Regular physical activity:** Even with reduced stamina, it is essential to maintain a routine of walks and exercise

to prevent sedentary behavior, obesity, and joint or cardiac problems.
- **Oral hygiene:** Regular tooth brushing helps prevent tartar accumulation and periodontal disease. It is estimated that 80% of dogs over three years of age exhibit periodontal disease (Wadia, 2021).
- **Frequent check-ups:** Semiannual examinations are recommended to monitor the cardiovascular, endocrine, urinary, lymphatic, respiratory, skeletal, and nervous systems.
- **Up-to-date vaccinations:** Maintaining an updated vaccination schedule is essential for preventing infectious diseases.
- **Adapted environment:** Provide non-slip rugs, elevated feeding bowls, and avoid abrupt changes in furniture layout, especially for dogs with vision or mobility impairments.

COMMON HEALTH PROBLEMS IN ELDERLY DOGS

Although numerous diseases may emerge with advancing age, it is essential to highlight those that occur most frequently in geriatric dogs due to their clinical relevance and impact on the animal's quality of life:
- **Cognitive dysfunction:** Characterized by behavioral changes such as disorientation, disturbances in the sleep–wake cycle disturbances, reduced social interaction, and memory loss, and is often compared to Alzheimer's disease in humans (Teixeira et al., 2024).
- **Cardiac diseases:** These include conditions such as congestive heart failure and cardiac murmurs, which compromise adequate cardiovascular function and tissue perfusion (Nam et al., 2024).
- **Visual impairment:** Diseases such as cataracts and glaucoma are common in elderly dogs and may lead to progressive vision loss, potentially progressing to blindness if not properly treated (Marchini et al., 2024).
- **Periodontitis:** A severe inflammation of the periodontal tissues, frequently associated with pain, tooth mobility, tooth loss, and an increased risk of secondary systemic infections (Wallis & Holcombe, 2020).
- **Osteoarthritis:** A degenerative joint disease that causes chronic pain, joint stiffness, and limited movement, directly affecting the animal's mobility and welfare (Lampo, 2024).
- **Neoplasms:** Benign or malignant tumors are more prevalent in elderly animals and may affect various organs and systems, requiring early diagnosis and specific management (Olin *et al.,* 2024).

Preventive veterinary care and continuous monitoring are essential for the early detection and effective management of these conditions, contributing to longevity and improved quality of life in senior dogs.

DENTAL PROBLEMS

Dental calculus

Dental calculus, also referred to as tartar, consists of mineralized bacterial plaque on the tooth surface, resulting from the accumulation of food debris and inadequate oral hygiene (Cunha *et al.*, 2022). This condition may trigger a variety of clinical signs, including halitosis, tooth discoloration, gingival bleeding, intense pain, and difficulty chewing.

In more advanced stages, the accumulation of tartar may progress to gingivitis

and periodontitis, inflammatory diseases that affect the supporting structures of the teeth and significantly compromise the animal's oral health. In addition, the prolonged presence of bacteria in the oral cavity facilitates their dissemination to other regions of the body, increasing the risk of systemic infections (Cunha *et al.*, 2022).

In severe cases, surgical intervention is required for tartar removal through a procedure known as tartarectomy (Cunha *et al.*, 2022). Therefore, regular tooth brushing with products formulated specifically for veterinary use is essential for preventing these conditions and preserving oral health, particularly in elderly dogs.

Gingivitis

Gingivitis is an inflammatory condition that affects the gingiva and may, in more advanced cases, extend to the tongue and oral mucosa. This condition is frequently associated with tartar accumulation and the development of dental disorders, presenting clinically as reddened and receded gums, as well as spontaneous bleeding (Cunha *et al.*, 2022).

Upon identification of signs suggestive of gingivitis, owners are advised to seek specialized veterinary care for an accurate diagnosis and appropriate therapeutic intervention. Clinical evaluation may include the use of a periodontal probe, a procedure performed under anesthesia to assess the depth of periodontal pockets and the extent of disease progression (Gawor *et al.*, 2022).

Treatment generally involves the administration of antibiotics to eliminate the bacteria responsible for the inflammation, as well as professional dental cleaning to remove accumulated tartar (Brunius *et al.*, 2020). In more complex cases, the veterinarian may request additional diagnostic tests, such as dental radiographs, a complete blood count, a leukogram, and blood glucose testing, to evaluate the animal's systemic condition and rule out concurrent comorbidities.

Periodontitis

If gingivitis is not properly treated, it may progress to periodontitis, a more severe condition that compromises the supporting structures of the teeth in dogs (Harvey, 2018). The main clinical signs include edematous and inflamed gingiva, pain or difficulty chewing, and loss of alveolar bone support, which may ultimately lead to tooth loss (Cunha *et al.*, 2022). Inadequate oral hygiene is the primary cause of periodontitis, underscoring the importance of regular tooth brushing.

Beyond oral consequences, periodontitis can significantly affect an animal's systemic health, increasing the risk of cardiac and renal complications (Salla *et al.*, 2025). These effects result from the systemic dissemination of inflammatory mediators as well as from bacterial translocation into the bloodstream, highlighting the importance of preventive oral care and early therapeutic intervention.

Diagnosis is established through clinical evaluation using a periodontal probe and, in more advanced cases, with the aid of radiographic imaging to determine the extent of bone loss (Lee *et al.*, 2023). Treatment varies according to disease severity: mild cases require regular prophylaxis with scaling to remove tartar and prevent disease progression, whereas severe cases may necessitate surgical interventions and multiple tooth extractions, as illustrated in Supplementary Figure 2. It is important to note that, in certain cases, the damage caused may be permanent.

OCULAR PROBLEMS

Corneal degeneration

Corneal degeneration is an ophthalmic condition characterized by the accumulation of lipids within the corneal stroma the thickest layer of the cornea often associated with neovascularization, defined as the abnormal formation of blood vessels in this region (Kalwad *et al.*, 2022). This disorder may be triggered by ocular trauma or by underlying systemic conditions such as hypercholesterolemia (elevated cholesterol levels) and hypercalcemia, which may occur without overt clinical signs. The main clinical manifestations observed in affected animals include white deposits on the corneal surface, corneal opacity, photophobia (light sensitivity), partial or complete loss of visual acuity, ocular pain, and epiphora (excessive tearing) (Dubielzig & Patnaik, 2022).

Diagnosis is established through specific ophthalmic examinations aimed at identifying ulcers, corneal lesions, or preexisting diseases associated with corneal degeneration. Treatment selection depends directly on the underlying cause and may include medical therapy, management of associated systemic diseases, and, in severe cases, surgical intervention (Michalak *et al.*, 2022).

Cataract

Cataract is an ocular disorder characterized by the progressive opacification of the lens, which may lead to significant visual impairment and, in advanced cases, complete blindness. This condition results from structural alterations of the lens, which gradually becomes opaque, acquiring bluish or whitish hues. Its development may be associated with genetic predisposition, aging, metabolic disorders, or congenital abnormalities (Fischer & Meyer-Lindenberg, 2018).

In its early stages, cataract may be mistaken for nuclear sclerosis because of their similar appearance; however, distinguishing between these conditions is essential. Nuclear sclerosis is a physiological, age-related change that does not progress to significant visual loss and results from the gradual condensation of lens fibers (Oliveira *et al.*, 2021). Differentiation requires a detailed ophthalmic examination: while the ocular fundus remains visible in cases of nuclear sclerosis, lens opacification in cataract prevents fundus visualization, allowing a clear distinction between the two conditions (Oliveira *et al.*, 2021).

The most common clinical signs of cataract include photosensitivity, excessive tearing, changes in eye color, and difficulty recognizing people, objects, or familiar environments (Suresh *et al.*, 2024). Diagnosis is based on clinical evaluation of the patient, complemented by specific ophthalmic tests such as the Schirmer tear test, which measures tear production, and tonometry, which assesses intraocular pressure (Suresh *et al.*, 2024).

Glaucoma

Glaucoma is a severe ophthalmic disorder characterized by an abnormal increase in intraocular pressure, resulting from impaired drainage of the aqueous humor, leading to progressive degeneration of the optic nerve (Farkas and Pe'er, 2024). It is a rapidly progressive disease that, if not properly treated, may result in irreversible blindness.

The most common clinical signs include severe ocular pain, conjunctival hyperemia, bluish corneal opacity, and abnormal enlargement of the globe in advanced stages (Evaristo, 2020). Glaucoma may

be classified into two main categories: primary, which arises from hereditary anatomical abnormalities of the aqueous humor drainage system, and secondary, which is associated with pre-existing conditions such as advanced cataracts, uveitis, and intraocular neoplasms (Davies & Miller, 2021).

Diagnosis is established through tonometry, an examination used to measure intraocular pressure. Treatment involves the use of topical agents and specific systemic medications aimed at reducing aqueous humor production and improving its outflow. In more severe cases, surgical intervention may be indicated or, as a last resort, enucleation (removal of the globe) followed by prosthesis implantation (Evaristo, 2020).

ORTHOPEDIC DISORDERS

Orthopedic diseases encompass fractures, injuries, inflammatory processes, and other conditions affecting the locomotor system, including bones, joints, muscles, and ligaments. These disorders are particularly prevalent in elderly dogs.

Spondylosis

Spondylosis is a chronic, degenerative disorder characterized by the formation of osteophytes (bony spurs) along the vertebrae of the spinal column. This condition results primarily from the progressive degeneration of the intervertebral joints. The main clinical signs include localized pain in the affected region, lameness, and weakness of the pelvic limbs (Wadowska *et al.*, 2023).

Although the exact causes of spondylosis remain under investigation, it is believed that factors such as vertebral instability, genetic predisposition, and specific anatomical characteristics are believed to contribute to its development. Certain breeds, including Boxers, Dachshunds, Pekingese, and Basset Hounds, show a higher predisposition to the disease, particularly due to disproportionate body conformation, such as an elongated spine relative to limb length (Wadowska *et al.*, 2023). In Boxers, specifically, there is evidence that suggests a hereditary association with the condition.

Spondylosis is diagnosed through imaging examinations such as radiography, magnetic resonance imaging, and myelography, the latter being particularly useful for detecting spinal cord lesions especially in the cervical region and for determining disease severity of the condition (Harder *et al.*, 2021). Additional diagnostic tests may be indicated to rule out concurrent pathologies.

Treatment is determined according to disease stage and clinical presentation. In early phases, anti-inflammatory drugs and analgesics are commonly administered to relieve pain relief (Barbosa *et al.*, 2022). Acupuncture has demonstrated efficacy as an adjunct therapy for chronic pain management. In more advanced or refractory cases, surgical intervention may be required. Physiotherapy plays a fundamental role in rehabilitation and in maintaining the animal's quality of life, with hydrotherapy representing an effective, low-impact therapeutic option (Barbosa *et al.*, 2022).

Intervertebral Disc Disease (IVDD)

Intervertebral disc disease (IVDD) is a neurological condition that occurs when the intervertebral discs of the canine spine undergo protrusion or extrusion, leading to spinal cord compression (Garcia and Jeffrey, 2022). This alteration may result

from a progressive degenerative process related to chronic wear or may occur acutely due to the sudden extrusion of disc material. Chondrodystrophic breeds, such as Dachshunds and Beagles, are particularly predisposed to the development of this disease because of specific anatomical and genetic characteristics (De Decker *et al.*, 2020).

Clinical signs vary according to the location and severity of the lesion and may include cervical or lumbar pain, stiffness and restricted mobility, urinary incontinence, and, in more severe cases, partial or complete paralysis of the limbs with loss of neurological function (Olby *et al.*, 2020).

Diagnosis is established through a detailed neurological assessment aimed at determining the exact location of the lesion, the degree of spinal cord compression, the level of pain, and the extent of mobility loss. Imaging modalities such as radiography, computed tomography (CT), and magnetic resonance imaging (MRI) are frequently used for confirmation and therapeutic planning (Da Costa and Parent, 2021). Treatment may be conservative (medical) or surgical, depending on the severity of the condition. When there is no improvement with medical management or in cases of severe neurological impairment, surgical intervention is indicated, consisting of spinal cord decompression and removal of herniated or calcified disc material.

Arthritis

Arthritis is an inflammatory condition that affects the joints and may progress, if not properly managed, to osteoarthritis, a degenerative joint disease of irreversible nature (Yin *et al.*, 2024). This condition is primarily caused by the progressive deterioration of articular cartilage and frequently affects the vertebral column. Several factors contribute to the development of arthritis, including obesity, advanced age, and genetic predisposition. According to Forsyth *et al.* (2023), Labrador Retrievers and German Shepherds exhibit increased susceptibility to arthritis. Additionally, breed-specific characteristics and environmental conditions, such as slippery flooring, increase the risk of microtrauma to the joints.

The most common clinical signs include lameness, difficulty rising and ambulating, joint stiffness, chronic pain, reduced appetite, and decreased quality of life (Kirkby, 2023). Diagnosis is based on a thorough clinical evaluation and may be complemented by imaging modalities such as radiography, as well as laboratory tests aimed at ruling out other causes of joint pain and inflammation (Da Costa & Parent, 2021).

Treatment of arthritis relies primarily on the administration of anti-inflammatory drugs for pain and inflammation control. In more advanced cases, surgical intervention may be indicated, particularly for the removal of osteophytes bony proliferations around the joints that cause pain and restrict movement (Kirkby, 2023).

In addition to pharmacological therapy, the adoption of complementary measures is essential. Weight control is one of the main pillars of disease management, as obesity exacerbates the load on compromised joints. Physiotherapy, joint supplements, and modifications to the home environment such as the use of non-slip mats are also strongly recommended to improve the animal's comfort and mobility (Kirkby, 2023).

AUTOIMMUNE DISEASES IN DOGS

The immune system is responsible for protecting the organism against invading agents. However, when a dysfunction occurs within this system, it may begin to attack the body's own cells. In this process, the immune system sends cells to isolate and destroy these "enemy cells" but inadvertently damages healthy tissues, generating a wide range of clinical signs. This mechanism underlies autoimmune diseases, which develop and become established by exploiting failures in immune regulation.

Hemolytic anemia

Hemolytic anemia is a pathological condition characterized by the premature destruction of red blood cells by the animal's own immune system (Duclos, 2024). Erythrocytes play a fundamental role in transporting oxygen to body tissues, and their excessive destruction compromises oxygenation, potentially affecting multiple organs. Hemolytic anemia may be of primary origin (idiopathic immune-mediated) or secondary to other diseases (Duclos, 2024).

Among the secondary causes are neoplasms, systemic infections, and infestations by internal or external parasites. Endoparasitic infections involving hematophagous intestinal parasites, as well as infestations by ectoparasites such as ticks, fleas, and lice, may also trigger this condition. The most common clinical signs include hematuria, fever, lethargy, apathy, weakness, dizziness, and pale mucous membranes, particularly noticeable on the gingiva (Duclos, 2024). In severe cases, circulatory collapse may occur.

Diagnosis is established through clinical evaluation and laboratory testing, including a complete blood count, urinalysis, bone marrow examination (myelogram), and the direct Coombs test, which detects antibodies bound to the surface of red blood cells, thereby confirming the immune-mediated nature of the disease (Duclos, 2024).

Treatment depends on the underlying cause. In cases of primary hemolytic anemia, therapy typically includes corticosteroids to suppress the immune response, blood transfusions in cases of severe anemia, and, when necessary, additional immunosuppressive agents. In secondary hemolytic anemia, treatment focuses on addressing the underlying condition, such as controlling parasites, managing infections, or treating associated neoplasms (Duclos, 2024).

Pemphigus foliaceus

Pemphigus foliaceus is an autoimmune dermatopathy characterized by the production of autoantibodies targeting epidermal cells, particularly desmosomes, which are structures responsible for maintaining cohesion between skin cells (Bizikova *et al.*, 2022). This autoimmune reaction leads to separation of the epidermal layers, resulting in the formation of pustules, crusts, and ulcerative lesions.

The most common clinical signs include erythema, pain, fever, malaise, vesicles, bullae, pustules, scales, crusts, fluid-filled cysts, superficial ulcers, and open wounds (Jordan *et al.*, 2024). These manifestations typically appear initially on the face, nasal planum, ears, and distal extremities, and may later spread to other regions of the body. Diagnosis is based on biopsy of cutaneous lesions, with histopathological analysis revealing acantholysis and inflammatory infiltration (Jordan *et al.*, 2024). Cytological examination can also be useful for detecting acantholytic cells and the presence of neutrophils.

Treatment of pemphigus foliaceus involves the use of immunosuppressive drugs (Jordan *et al.*, 2024). In refractory or long-term cases, immunomodulatory agents may be added to control the autoimmune response and minimize the adverse effects associated with continuous corticosteroid therapy.

Polyarthritis

Canine polyarthritis is an inflammatory condition affecting multiple joints, resulting from an autoimmune response in which the immune system targets the synovial lining of the joints (Cruzado *et al.*, 2024). This process leads to pain, swelling, and functional impairment. The disease may have an infectious origin, caused by agents such as bacteria, viruses, fungi, or protozoa, or it may be immune-mediated (Cruzado *et al.*, 2024). Although polyarthritis is non-erosive in most cases, joint structure destruction, including cartilage and bone damage, may occur in certain situations.

The most frequent clinical signs include difficulty walking, intermittent lameness, loss of motor coordination, joint swelling, and arthralgia (Ravicini *et al.*, 2022). The joints most commonly affected are the carpus, elbow, tarsus, and stifle.

Diagnosis is based on a comprehensive clinical approach, including a thorough physical examination, specific orthopedic assessments, imaging studies such as radiography and ultrasonography, and laboratory evaluations that may reveal leukocytosis, altered inflammatory parameters, and, in some cases, abnormalities in synovial fluid samples (Ravicini *et al.*, 2022).

Treatment of primary non-erosive polyarthritis is predominantly immunosuppressive. Therapy includes the use of corticosteroids and, when necessary, additional immunomodulatory agents to control the dysregulated immune response (Ravicini *et al.*, 2022).

Degenerative diseases

Degenerative diseases in dogs have no definitive cure and show progressive evolution, worsening over time. However, with appropriate veterinary follow-up, it is possible to implement therapeutic strategies that control clinical signs, reduce discomfort, and improve the animal's quality of life. The following are some of the main degenerative disorders in dogs:

- **Osteoarthritis:** A degenerative joint disease characterized by significant pain and restricted movement, resulting from the progressive deterioration of articular structures. It may arise from previous trauma, poor anatomical conformation, or excessive joint loading, ultimately compromising the stability and functionality of the affected joints (Barbeau-Grégoire, 2022).
- **Hip dysplasia:** A congenital malformation of the hip joints, frequently associated with genetic, environmental, and nutritional factors, as well as the inappropriate use of calcium supplements during growth (Vasseur *et al.*, 2021). This condition leads to misalignment of the coxofemoral joint, causing pain, inflammation, and difficulty in ambulation.
- **Vertebral column disorders:** These may have multiple etiologies, including infections, tumors, genetic predisposition, trauma, or falls. Such alterations can result in spinal cord compression, leading to pain, loss of motor coordination, and, in more severe cases, paralysis (Harder *et al.*, 2021).
- **Degenerative myelopathy:** A progressive neurological disease characterized by degeneration of spinal cord neurons,

impairing coordination and hind limb movement. As the condition advances, affected animals may progress to paraplegia (Bouché *et al.*, 2023).

- **Cognitive Dysfunction Syndrome (CDS):** A neurodegenerative disorder analogous to Alzheimer's disease in humans (Nousiainen *et al.*, 2023). It primarily affects elderly dogs and manifests through disorientation, behavioral changes, memory loss, incontinence, and disturbances in the sleep–wake cycle.
- **Neuronal ceroid lipofuscinosis:** A rare genetic disorder that results in abnormal accumulation of lipid substances within neurons, causing progressive dementia, abrupt behavioral changes, loss of motor coordination, and seizures (Mhlanga-Mutangadura *et al.*, 2024).

TREATMENTS

In veterinary medicine, particularly in the field of geriatrics, various therapeutic approaches have been employed to address the specific needs of elderly dogs. These treatments aim to alleviate discomfort, control clinical signs, and contribute to maintaining quality of life, while also taking into account the physiological changes inherent to aging.

In general, they include interventions focused on pain control, improved mobility, support of organ functions, and stabilization of diseases commonly observed in this age group. It is also important to note that the treatments discussed at the end of this section are specific to certain geriatric pathologies and do not constitute innovative therapeutic approaches.

Stem cell therapy

Stem cell therapy has emerged as a promising alternative for the treatment of neurological sequelae and keratoconjunctivitis, while also helping to reduce the adverse effects associated with conventional treatments (Pérez-Merino *et al.*, 2020). This therapeutic approach is based on the collection of stem cells, which can be obtained from specific anatomical sites such as dental pulp, bone marrow, and abdominal adipose tissue (Oliveira & Buzinaro, 2021).

Collection is performed under anesthesia using an appropriate needle to obtain the material (Gross *et al.*, 2022). The cells then undergo a purification process, in which they are separated from other components present in the sample. Subsequently, they are stimulated to promote cellular proliferation and maintained in a nutrient solution for approximately three days.

During the practical phase of treatment, the veterinarian administers the stem cells via injections directly into the affected organs or tissues. In more complex cases, up to three applications are recommended (Gouveia *et al.*, 2023). Following administration, the animal enters a recovery period, during which the differentiated stem cells promote regeneration of damaged tissues, contributing to the restoration of function and overall health (Gouveia *et al.*, 2023).

Treatment of canine prostatic cancer

Another therapeutic approach is the management of canine prostatic cancer, which combines chemotherapy with anti-inflammatory drugs (Gibson *et al.*, 2024). Prostatic tumors express an enzyme known as cyclooxygenase-2 (COX-2). Doxorubicin ($C_{27}H_{29}NO_{11}$), the chemotherapeutic agent used, in combination with nonsteroidal anti-inflammatory drugs, inhibits this enzyme, which is directly associated with tumor proliferation.

Gene therapy

Gene therapy is employed in the treatment of various diseases through the introduction of genetic material (DNA or RNA) into the patient's cells. This procedure involves inserting a gene of interest into a vector typically a genetically modified, harmless virus which serves as a vehicle to deliver the genetic material to the target cells (Reis & Martins, 2023).

The viral vector, owing to its natural ability to infect cells, is modified so that it does not cause disease and instead assumes a therapeutic role by transferring the functional gene into the organism (Santos & Oliveira, 2022). Once internalized, the introduced gene can correct, replace, or supplement the function of defective or absent genes, promoting cellular recovery and contributing to the restoration of physiological function in the affected tissue.

This approach broadens the therapeutic possibilities in veterinary medicine, particularly for the management of genetic, oncologic, neuromuscular, and immunological disorders, and remains a promising area of research for developing more specific and long-lasting interventions (Reis & Martins, 2023).

Phacoemulsification

Cataracts in elderly dogs are also a common condition. Phacoemulsification surgery is frequently employed method to correct this problem. The procedure is performed through the cornea, creating a small incision to introduce a device that opens the lens capsule and allows access to the cataract (Kim & Lee, 2022). An ultrasound probe is then used to fragment and aspirate the lens, after which an artificial intraocular lens is implanted inside the capsule. When performed in the early stages of the disease, outcomes are generally more favorable. However, in advanced cases, some complications may arise during surgery, such as postoperative inflammation may occur, although satisfactory results can still be achieved (Kim & Lee, 2022).

FINAL CONSIDERATIONS

The evidence compiled in this review highlights the importance for both caregivers and veterinarians to understand the most prevalent health conditions in elderly dogs, as early detection of clinical alterations is crucial for more effective management. Advances in veterinary geriatrics have expanded knowledge of the specificities of canine aging, enabling the implementation of more appropriate and individualized care strategies.

Continuous monitoring and periodic consultations are fundamental strategies in the routine care of geriatric dogs. These practices allow for the early identification of clinical changes, enabling timely, evidence-based interventions. In this way, they directly contribute to maintaining quality of life, managing established diseases, and preventing the progression of multiple age-related conditions. Therefore, regular follow-up and proper guidance for caregivers is emphasized, as these elements are essential for promoting healthy and dignified aging in elderly animals.

Ongoing scientific developments in this field are expected to continue refining prevention, diagnostic, and management methods, thereby enhancing the support provided to aging dogs. Accordingly, this review aims to organize and synthesize current knowledge, support the continuing education of caregivers and professionals, encourage reflection and improvement of

clinical practice, and foster further research on canine aging.

DECLARATION OF CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest related to the preparation or publication of this article.

DECLARATION OF FUNDING SOURCES

This work did not receive financial support from public, private, or institutional funding agencies.

DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The author used artificial intelligence tools exclusively to assist with the linguistic revision of this manuscript. All scientific, technical, and analytical content was entirely produced, reviewed, and validated by the author.

ACKNOWLEDGMENTS

The author expresses gratitude to her parents for their unwavering support and for providing the conditions that enabled her academic journey; to her brother, for his assistance and encouragement during the development of this work; and to her companion animals, the dog Dudu and the cat Pandora, who were a constant source of inspiration and motivation in choosing Veterinary Medicine, leaving a legacy of love, inspiration, and purpose.

REFERENCES

Barbosa, C. S., Pereira, A. A., & Lima, A. R. (2022). Pain management and physiotherapy in canine degenerative spinal diseases: A systematic review. *Veterinary Medicine International, 2022*, Article ID 9465937. https://doi.org/10.1155/2022/9465937

Bizikova, P., Linder, K. E., & Mamo, L. B. (2022). Trunk-dominant and classic facial pemphigus foliaceus in dogs – comparison of anti-desmocollin-1 and anti-desmoglein-1 autoantibodies and clinical presentations. *Veterinary Dermatology, 33*(5), 414–425. https://doi.org/10.1111/vde.13094

Bouché, T. V., Coates, J. R., Moore, S. A., Faissler, D., Rishniw, M., & Olby, N. J. (2023). Diagnosis and management of dogs with degenerative myelopathy: A survey of neurologists and rehabilitation professionals. *Journal of Veterinary Internal Medicine, 37*(5), 1815–1820. https://doi.org/10.1111/jvim.16829

Brunius Enlund, K., Karlsson, M., Brunius, C., Hagman, R., Höglund, O. V., Gustås, P., & Hanson, J. (2020). Professional dental cleaning in dogs: Clinical routines among Swedish veterinarians and veterinary nurses. *Acta Veterinaria Scandinavica, 62*, 61. https://doi.org/10.1186/s13028-020-00559-7

Cruzado Perez, J., Travail, V., Lamb, V., & Kelly, D. (2024). Canine immune-mediated polyarthritis: A review of 84 cases in the UK between 2011 and 2021. *Veterinary Medicine and Science, 10*(2). https://doi.org/10.1002/vms3.1306

Cunha, E., Tavares, L., & Oliveira, M. (2022). Revisiting periodontal disease in dogs: How to manage this new old problem? *Antibiotics, 11*(12), 1729. https://doi.org/10.3390/antibiotics11121729

Da Costa, R. C., & Parent, J. (2021). Intervertebral disc disease in dogs: Diagnosis and treatment. *Companion Animal, 26*(10), 540–553. https://doi.org/10.12968/coan.2021.26.10.540

Davies, A., & Miller, P. E. (2021). Glaucoma in dogs: Etiology, diagnosis, and treatment. *Veterinary Clinics of North America: Small Animal Practice, 51*(3), 517–535. https://doi.org/10.1016/j.cvsm.2021.02.004

De Decker, S., Volk, H. A., & Packer, R. M. A. (2020). Intervertebral disc disease in dogs: A review of diagnosis, treatment, and prognosis. *The Veterinary Journal, 259*, 105463. https://doi.org/10.1016/j.tvjl.2020.105463

Dias-Pereira, P. (2022). Morbidity and mortality in elderly dogs – a model for human aging. *BMC Veterinary Research, 18*, Article 44. https://doi.org/10.1186/s12917-022-03518-8

Duclos, A. A., Bailén, E. L., Barr, K., Le Boedec, K., & Cuq, B. (2024). Clinical presentation, outcome and prognostic factors in dogs with immune-mediated haemolytic anaemia: A retrospective single-centre study of 104 cases in Ireland (2002–2020). *Irish Veterinary Journal, 77*, Article 16. https://doi.org/10.1186/s13620-024-00277-w

Evaristo, T. A. (2020). Síndrome glaucomatosa em Chihuahua: Da hipertensão ocular ao glaucoma. *Pubvet, 14*(6), 1–7. https://doi.org/10.31533/pubvet.v14n6a588

Farkas, Z., & Pe'er, J. (2024). Role of inflammation in canine primary glaucoma. *Animals, 14*(1), 110. https://doi.org/10.3390/ani14010110

Forsyth, K. K., Snyder-Mackler, N., & Creevy, K. E. (2023). Lifetime prevalence of owner-reported osteoarthritis in the 10 most common dog breeds in the Dog Aging Project cohort. *Frontiers in Veterinary Science, 10*, 1140417. https://doi.org/10.3389/fvets.2023.1140417

Garcia, M., & Jeffery, N. D. (2020). Intervertebral disc disease in dogs: Diagnosis and treatment. *The Veterinary Journal, 263*, 105517. https://doi.org/10.1016/j.tvjl.2020.105517

Gawor, J. P., Nemec, A., & Strøm, P. (2022). Treatment of naturally occurring periodontitis in dogs with a new bio-absorbable regenerative matrix. *Frontiers in Veterinary Science, 9*, 916171. https://doi.org/10.3389/fvets.2022.916171

Gibson, E. A., & Culp, W. T. N. (2024). Canine prostate cancer: Current treatments and the role of interventional oncology. *Veterinary Sciences, 11*(4), 169. https://doi.org/10.3390/vetsci11040169

Gouveia, D., Correia, J., Cardoso, A., Rodrigues, C., Duarte, A., & Silvestre, A. (2023). Intensive neurorehabilitation and allogeneic stem cell transplantation in canine degenerative myelopathy. *Frontiers in Veterinary Science, 10*, 1192744. https://doi.org/10.3389/fvets.2023.1192744

Gross, M. H., & Hernáez, A. (2022). Standardized protocol for canine adipose-derived mesenchymal stem cell isolation, expansion, and quality control for therapeutic use. *Frontiers in Veterinary Science, 9*, 807654. https://doi.org/10.3389/fvets.2022.807654

Harder, S. M., Mai, W., & Schwarz, C. (2021). Imaging of canine spinal disorders. *The Veterinary Journal, 276*, 105744. https://doi.org/10.1016/j.tvjl.2021.105744

Jordan, T. Y., Cain, B. C., & Olivry, T. (2024). Canine and feline pemphigus foliaceus—An update on clinical signs and management. *Veterinary Clinics of North America: Small Animal Practice, 54*(6), 1203–1230. https://doi.org/10.1016/j.cvsm.2024.11.010

Kalwad, A., Agraharam, S. G., & Polisetty, S. (2022). Multimodal ocular imaging of known and novel corneal stromal disorders in dogs. *BMC Veterinary Research, 18*(1), 129. https://doi.org/10.1186/s12917-022-03214-7

Kerr, P. J., & Gaskin, J. M. (2020). Corneal lipid infiltration and neovascularization in dogs: Pathophysiology and clinical management. *Veterinary Ophthalmology, 23*(1), 123–131. https://doi.org/10.1111/vop.12705

Key, M. A. (2024, January 9). Nutritional management of aging pets. *Open Access Government*. https://doi.org/10.56367/OAG-041-10660

Kim, J. H., & Lee, J. H. (2022). Comparison of the outcomes of phacoemulsification versus topical medication alone for canine diabetic cataracts. *Journal of Veterinary Science, 23*(1), e16. https://doi.org/10.4142/jvs.23164

Kirkby Shaw, K. (2023). Non-pharmacologic management of canine osteoarthritis: Part 1. *Journal of Small Animal Practice, 64*(11), 38–46. https://doi.org/10.1111/jsap.13654

Laflamme, D. P., & Xu, H. (2024). Nutrition and aging in dogs and cats. *Journal of Small Animal Practice, 65*(2), 115–125. https://doi.org/10.1007/s11357-024-01001-2

Lampo, A., et al. (2024). Prevalence of osteoarthritis in the shoulder, elbow, hip and stifle joints of dogs older than 8 years. *The Veterinary Journal, 305*, 106132. https://doi.org/10.1016/j.tvjl.2024.106132

Lee, B. L., Soukup, J., Rendahl, A., & Goldschmidt, S. (2023). Clinical success of guided tissue regeneration for treating vertical bone and furcation defects in dogs. *Frontiers in Veterinary*

Science, 10, 1247347. https://doi.org/10.3389/fvets.2023.1247347

Marchini, L., Fachini, F. A., & Rabelo, I. P. (2024). Oftalmopatias em 574 cães da raça Shih Tzu atendidos em hospital veterinário: Estudo retrospectivo. *Ciência Animal Brasileira, 25*, Artigo e-79326. https://doi.org/10.1590/1809-6891v25e-79326E

Michalak, S. R., Kim, S., Park, S., Casanova, M. I., Bowman, M. A. W., Ferneding, M., Leonard, B. C., Good, K. L., Li, J. Y., & Thomasy, S. M. (2022). Topical ripasudil for the treatment of primary corneal endothelial degeneration in dogs. *Translational Vision Science & Technology, 11*(9), 2. https://doi.org/10.1167/tvst.11.9.2

Mhlanga-Mutangadura, T., Bullock, G., Cerda-Gonzalez, S., & Katz, M. L. (2024). Neuronal ceroid lipofuscinosis in a mixed-breed dog with a splice-site variant in CLN6. *Genes, 15*(6), 661. https://doi.org/10.3390/genes15060661

Montoya, J. A., Gallego, M., García, M., & Rosado, B. (2024). Ageing canine companions: Most common manifestations and the impact of selected factors. *Preventive Veterinary Medicine, 224*, 105948. https://doi.org/10.1016/j.prevetmed.2024.105948

Nam, Y., White, M., Karlsson, E. K., Creevy, K. E., Promislow, D. E. L., & McClelland, R. L. (2024). Dog size and patterns of disease history across the canine age spectrum: Results from the Dog Aging Project. *PLOS ONE, 19*(1), e0295840. https://doi.org/10.1371/journal.pone.0295840

Nousiainen, A. K., & Landsberg, G. (2023). Cognitive changes associated with aging and physical disease in canine cognitive dysfunction syndrome. *Veterinary Clinics of North America: Small Animal Practice, 53*(2), 283–297. https://doi.org/10.1016/j.cvsm.2022.11.009

Olby, N. J., Levine, J. M., Harris, T., Munana, K. R., Skeen, T., Sharp, N. J., & Platt, S. R. (2020). Long-term functional outcome of dogs with thoracolumbar intervertebral disc herniation causing complete loss of deep pain perception: 69 cases (1996–2006). *Journal of the American Veterinary Medical Association, 257*(3), 258–264. https://doi.org/10.2460/javma.257.3.258

Olin, B., Creevy, K. E., McClelland, R. L., Promislow, D. E. L., & Kaeberlein, M. (2024). Defining healthy aging in older dogs and differentiating healthy aging from disease. *Journal of the American Veterinary Medical Association, 246*(1), 77–90. https://doi.org/10.2460/javma.246.1.77

Oliveira, K. C. A., et al. (2021). Catarata vs. esclerose em cães: Como diferenciar? – Revisão de literatura. *Revista Multidisciplinar em Saúde, 2*(3), 127. https://doi.org/10.51161/rems/2389

Oliveira, M. D. L., & Buzinaro, M. F. (2021). Mesenchymal stem cell therapy for aging-related diseases in dogs: A review. *Veterinary Science, 8*(10), 226. https://doi.org/10.3390/vetsci8100226

Oliveira, K.C.A.Esclerose em cães: como diferenciar? https://doi.org/10.51161/rems/2389

Pérez-Merino, P., Navarro-Cid, J., Castejón, F. M., & García-Ruiz, R. (2020). Mesenchymal stem cell therapy in veterinary ophthalmology: Clinical evidence and prospects. *Veterinary Ophthalmology, 23*(Suppl. 1), 59–70. https://doi.org/10.1111/vop.12875

Ravicini, S., Kent, A., Dunning, M., Baines, S. J., Clarke, S., & Allerton, F. (2022). Description and outcome of dogs with primary immune-mediated polyarthritis: 73 cases (2012–2017). *Journal of Small Animal Practice, 64*(3), 142–148. https://doi.org/10.1111/jsap.13565

Reis, L. A., & Martins, T. G. (2023). Advances in gene therapy for veterinary medicine: Applications and future perspectives. *Frontiers in Veterinary Science, 10*, 112345. https://doi.org/10.3389/fvets.2023.112345

Salla, A., et al. (2025). Modifiable early life risk factors for dental calculus in dogs. *BMC Veterinary Research, 21*, Article 35. https://doi.org/10.1186/s12917-025-04885-8

Santos, M. C., & Oliveira, R. F. (2022). Viral vectors in veterinary gene therapy: Mechanisms and therapeutic applications. *Journal of Veterinary Research, 66*(4), 295–307. https://doi.org/10.2478/jvetres-2022-0031

Suresh, S., Kumar, S., & Ramesh, R. (2024). Estudo da ocorrência de catarata e seu manejo cirúrgico em cães. *Indian Journal of Animal Research, 58*(1), 1–5. https://doi.org/10.21451/ijar.2024.01.001

Teixeira, P. A. M., Antonio, I. M. da S., Mattana, D. L. C., Pina, M. C. da S. L., & Peixoto, M. F. N. (2024). Síndrome da disfunção cognitiva canina: Revisão da literatura. *Research, Society and Development, 13*(11), e92131147446. https://doi.org/10.33448/rsd-v13i11.47446

Vajányi, D., Skurková, L., Peťková, B., Kottferová, L., Kasičová, Z., Simanová, V., & Kottferová, J. (2024). Ageing canine companions: Most common manifestations and the impact of selected factors. *Applied Animal Behaviour Science, 271*, Article 106164. https://doi.org/10.1016/j.applanim.2024.106164

Vasseur, E., & Harasen, G. (2021). Genetic and environmental risk factors for canine hip dysplasia: A critical review. *Frontiers in Veterinary Science, 8*, 791434. https://doi.org/10.3389/fvets.2021.791434

Wadia, R. (2021). Periodontal disease in dogs. *British Dental Journal, 231*(4), 242. https://doi.org/10.1038/s41415-021-3401-5

Wadowska, I., Łuszczewska-Sierakowska, I., & Dzierżęcka, M. (2023). Prevalence of spondylosis deformans and estimates of genetic parameters for the degree of osteophytes development in Italian Boxer dogs. *Acta Veterinaria Scandinavica, 65*(1), 1–8. https://doi.org/10.1186/s13028-023-00534-0

Wallis, C., & Holcombe, L. J. (2020). A review of the frequency and impact of periodontal disease in dogs. *Journal of Small Animal Practice, 61*(9), 529–540. https://doi.org/10.1111/jsap.13218

Yin, X., Wang, Q., Tang, Y., et al. (2024). Research progress on macrophage polarization during osteoarthritis disease progression: A review. *Journal of Orthopaedic Surgery and Research, 19*, 584. https://doi.org/10.1186/s13018-024-05052-9

Forma de citación del artículo:

Silva Pinheiro J. A. (2025). Veterinary medicine and canine aging: general aspects of the identification and treatment of major diseases in geriatric dogs. *Rev Med Vet Zoot. 72*(3): e120626. https://doi.org/10.15446/rfmvz.v72n3.120626