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NOW WHY DID I COME HERE? CANINE COGNITIVE DYSFUNCTION

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Introduction

The first indication an owner has of any problem with their dog is a change in its behaviour. Some of these problems will be due to medical reasons, others due to behavioural reasons and some due to a combination of both.

Senior pet care is an increasingly important component of modern veterinary medicine. The senior dog may have distinct and specific behavioural changes and it is important to recognise the underlying mechanisms for these in order to differentiate and then correctly diagnose the problem. This way the best options for the treatment and management of behavioural problems in the senior dog are offered.

Behaviour problems continue to be the number one reason for euthanasia of a pet of any age and it is still the largest cause of death of puppies under one year of age. Indeed, the average age of dogs in Australia, and world wide, is estimated to be around 3.5 years, which is well below their potential biological age. Hence, one thing is certain; if a pet manages to stay in the family until it is a senior citizen, then one can assume that the bond between the human and the animal is strong. Regardless of the strength of the bond, as aging occurs the quality of life experienced by both the owner and the dog may deteriorate.

Aging is one process that is common to all. Better veterinary care is ensuring that companion animals are living longer and hopefully, healthier and happier lives. Over time increasing numbers of 20-year-old cats or 18-year-old dogs will present as patients. In 1997 in the United States 11% of dogs were over 10 years of age and this is similar in Australia.

As pets age they may be less able to interact with the owners, or go for long walks that they once enjoyed together. They may start to have accidents inside, become more vocal, less obedient or less tolerant of being handled.

Often such behaviour changes are considered by the owners to be just part of normal aging and they presume that nothing can be done. Hence, it does not prompt a visit to the veterinarian and the owners continue to live with their pet until they can no longer tolerate the behaviour and the animal is euthanised.

These behavioural changes can be due to medical problems such as cardiac disease, osteoarthritis, incontinence, cataracts, or other causes such as chronic pain and this physical impairment may be considered part of the normal aging process. It is also important to recognise that as dogs and cats age physically their senses, such as hearing, are deteriorating as well and this may contribute to some behavioural changes. However, some of these behavioural changes can be due to cognitive decline, and this also needs to be recognised.

Although aging is normal it need not always involve cognitive decline as evidenced by the thousands of people and pets that age without apparent cognitive impairment, despite physical impairment. Thus, when dealing with older pets it is important to recognise that not all these behavioural changes may be due to the normal aging process.

Cognitive decline is one of the most distressing to witness, be it in people or pets and many owners have great difficulty in coping with the pet that no longer knows them or that they no longer know. Increasingly veterinarians are recognising this and are being provided with more and more ways to deal with them.

Alzheimers Disease (AD)

Alzheimer's is a neurodegenerative disorder in people that is characterised by a progressive decline in cognition. It affects multiple systems such as memory, language, and visual spatial skills. Diagnosis of probable AD is largely one of exclusion of other causes of cognitive dysfunction as diagnosis cannot be made until post mortem. This is then based on the presence of neurofibrillary tangles and senile beta amyloid plaques, either diffuse, neuritic or classic.

In humans with neurodegenerative disorders the level of monoamine oxidase B (MAO-B) is also dramatically increased.

Canine Cognitive Dysfunction Syndrome (CDS)

Behaviour problems can and do occur at any age, but canine cognitive dysfunction syndrome is one that is specific to the older dog. Canine Cognitive dysfunction syndrome is now being recognised as one of the important reasons why dogs show some behavioural changes that may not be directly attributable to physical causes. It has been defined as "geriatric onset behaviour problems not exclusively attributable to a general medical condition such as neoplasia or organ failure." It is often categorised into four main areas where behavioural changes are seen: disorientation, decreased social interaction, inappropriate elimination (urine and faeces), and changes in the sleep-wake activity cycle.

Pathogenesis of CCD:

Although incompletely understood, the brains of senile dogs and human patients suffering from Alzheimer's disease have comparable neuropathological findings. A consistent finding in both is neuron loss and cortical atrophy as well as deposition of predominantly diffuse beta-amyloid plaques. Unlike humans, dogs do not develop neurofibrillary tangles and neuritic plaques are rare. Most deposition in dogs is in the cerebral cortex and the hippocampus, an area associated with memory. In senile dogs a correlation exists between the quantity of beta-amyloid accumulation and the degree of cognitive decline.

In addition to neuronal death neurotransmitter dysfunction also contributes to changes seen in the older brain. Monoamine oxidase B (MAO-B) activity is increased, while the concentration of the neuromodulator 2-phenylethylamine is decreased. A consequence of increased MAO-B is decreased dopamine function, which in turn leads to increased production of free radicals, the neurotoxic by-products of dopamine metabolism, which leads to further degeneration and are hypothesised to be contributing factors in the development of CDS.

Prevalence:

A survey was conducted by the University of California in Davis of dog owners with pets aged between 11-16 years. Owners were asked about their dogs sleeping habits, sleep wake

cycles, interaction with the family, disorientation and loss of toilet training or inappropriate urination. 62% of these owners reported that their dog exhibited behavioural changes in at least one of these areas.

When subgrouped according to age 32 % of 11-year-old dogs and 100% of 16-year-old dogs showed at least one of these changes. Of these 28% of the 11-12 year old dogs were classified as mildly affected and 10 % severely affected, rising to 68% of 15-16 year old dogs being mildly affected and 35% severely affected.

Presenting Signs:

CDS is a multifactorial syndrome. The most common signs attributable to CDS include: loss of learnt behaviours such as toilet training; confusion/disorientation such as staring into space or getting lost in corners; not being as interactive socially with owners; compulsive behaviours such as vocalisation for no apparent reason; aggression; change in sleep wake cycles such as increased sleeping during the day and restlessness at night; change in appetite.

Diagnosis:

A thorough medical work up is essential, as CDS is also a diagnosis of exclusion in dogs. A complete physical examination, including a neurological work up, as well as blood work, including thyroid function should be made prior to making a diagnosis of CDS.

Differential diagnoses should include behavioural and physical reasons for the clinical signs seen. For example when an older dog presents with inappropriate elimination rule outs should include medical causes such as diabetes, renal failure, cystitis, incontinence and arthritis. Additionally, rule outs for environmental reasons that should be considered include no access to the area usually used, for example because the door was shut or the stairs too steep because of arthritic pain. Additionally, behavioural causes such as separation anxiety and phobia also need to be considered.

Treatment:

Treatment involves directly addressing the physical as well as behavioural causes and implementing management strategies that may involve environmental modification as well as a behaviour modification program. Clients need to understand that like most behavioural problems old age problems can be successfully managed but not cured. However, the quality of life can be improved by controlling the signs.

There are a number of medications and diets that may be indicated in veterinary behavioural practice, however medication requires a diagnosis by a veterinarian. Nurses should refer all cases which appear to require more than training, and especially which could involve anxiety, to their veterinarian for a full medical workup. The veterinarian, depending on their knowledge and interests, may then work up the behaviour case or refer it on to a veterinary behaviourist.

Nicergoline has been recommended for dogs showing signs consistent with aging related behavioural disorders (canine cognitive dysfunction syndrome (CDS) and cerebral insufficiency of vascular origin. It is an alpha-adrenergic antagonist and it is used in humans for the prevention and treatment of cerebrovascular disorders and arteriosclerotic diseases.

Selegiline is a reversible Monoamine Oxidase-B inhibitor (MAOI-B). In humans selegiline has been used in the treatment of Parkinson's disease as well as an antidepressant. In the USA and Australia the main behavioural use of selegiline is for Canine cognitive dysfunction syndrome in old dogs. It is also useful in some anxiety problems. It may take up to three

months to see the full behavioural benefits of selegiline although often owners have reported improvement in their dogs within 7-10 days.

Propentofylline is a xanthine derivative that has proved effective in clinical trials in patients with vascular dementia and those with dementia of the Alzheimer type. Some of the pathological process of Alzheimer's including glial cell activation and increased production of cytokines, free radicals and glutamate have been shown to be modulated by propentofylline.

Propentofylline has been demonstrated to improve learning and memory deficits induced by beta-amyloid protein deposition. In clinical studies in humans it improved cognitive functions and improved the ability of patients suffering from Alzheimer's disease and vascular dementia to cope with the routine tasks of daily life.

Propentofylline is recommended to improve dullness, lethargy and overall demeanour in old dogs. It is claimed to increase exercise and activity and decrease in sleeplessness in dogs.

Nutritional manipulation through the use of special diets eg Hills B/D and some dietary supplements have been shown to be beneficial both in the treatment and the prevention of canine cognitive dysfunction. In particular research has looked at the effects of dietary manipulation on canine short-term memory and has assessed this with reference to particular learning and memory tasks. This is particularly significant since loss of short-term memory is known to be one of the first indications of similar conditions in humans. Researchers have found that cognitive performance can be improved with a diet supplemented with a broad spectrum of antioxidants, which are believed to prevent the development of the age-related neuropathology. In addition antioxidants are believed to promote recovery in neurons that are exhibiting signs of neuropathology and therefore commercially available diets or nutritional supplements enhanced with these agents are believed to constitute an important part of the treatment plan for behavioural disorders in the older pet.

The synthetic pheromone analogues Dog Appeasing Pheromone (Adaptil) can also be useful in decreasing concurrent anxiety.

There are also a number of other products available such as Aktavait, Senilife etc and other nutraceuticals but some have little data to support their use while others have proven more useful.

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