Canine Cognitive Dysfunction

Canine cognitive dysfunction (CCD) is a disease where degenerative age-related changes in the brain cause a decline in a dog's memory, sleep patterns and even personality. CCD draws parallels with Alzheimer's disease in people and is nicknamed "doggy dementia". Unfortunately, it's unknown exactly what causes dementia in dogs or why some seem more severely affected than others. A diagnosis is based on clinical signs and exclusion of all other potential causes.

Neurons in the brain transmit essential information through the body and regulate mental, physical and emotional interactions. Degenerative changes occur, causing the build-up of a protein called beta-amyloid, which creates toxic conditions for neurons, and oxidative damage which is associated with a decline in cognitive function. Other changes that can occur in affected dogs' brains include small bleeds, an increase in the thickness of the meninges, and reduction of overall brain size (as a consequence of cell shrinkage and cell death).

Generally, canine cognitive dysfunction worsens with age but other factors related to ageing, such as reduced mobility, hearing loss and vision loss, can exacerbate the problem and make navigating their world even more challenging.

Signs of Dog Dementia

Unlike most diseases, there is no single test for CCD. It is diagnosed by identifying the signs and symptoms that you as the main caregiver observe at home. It is also important to rule out other potential causes of these signs such as high blood pressure (hypertension), orthopaedic pain, endocrine disease, liver or kidney disease and brain tumours.

As the owner, you are the most helpful judge of this as you are well acquainted with their normal routine, habits and behaviour, and any changes you may see that is not normal for them. Signs to watch for may include;

- **Anxiety:** Anxiety in dogs can be one of the first signs of canine dementia and if a dog develops new anxieties to things that previously would not have upset them, then canine cognitive dysfunction should be considered so treatment can be instigated early. This may include separation anxiety when they were previously happy to be left by their main caregiver, noise phobias, and fear of new people or new situations.
- **Disturbed sleep patterns:** Changes to their sleep cycle are among the most common signs of dementia in dogs. Some dogs want to go outside in the middle of the night for no apparent reason. Others may pace around the house all night, while some may become more vocal during nighttime hours.
- **Pacing:** Another common sign of CCD is constant pacing. This can be during the day but is often early evenings. Many dogs have a regular route that they follow, often in a circle along the edge of a room. In severe cases, this route is repeated over and over, with no reason or goal. Some dogs may actually get stuck behind doorways or in corners, and not know how to get out.
- **Abnormal Vocalization:** Dogs with dementia may howl, whine, or bark for no reason. Many dogs with dementia also experience some hearing loss, which can add to the problem. This can happen at any time of day or night. Similarly, cats may let out a distressed meow or howl.
- **Toilet Trouble:** If your older dog is starting to have accidents in the house, this can be a sign of dementia. They may not even realise they are doing it. Dogs that have previously been well house-trained, may start urinating or defaecating in the house. They may eliminate in random locations in the house, in their bed or sleeping area, or they may have the opportunity to go outside to the toilet, then come straight back in and wee in the house. Keep in mind that there can be other causes of more frequent accidents, such as polyuria (increased urination), due to kidney disease, Cushing's disease and diabetes. In older dogs, there can also be an element of incontinence when

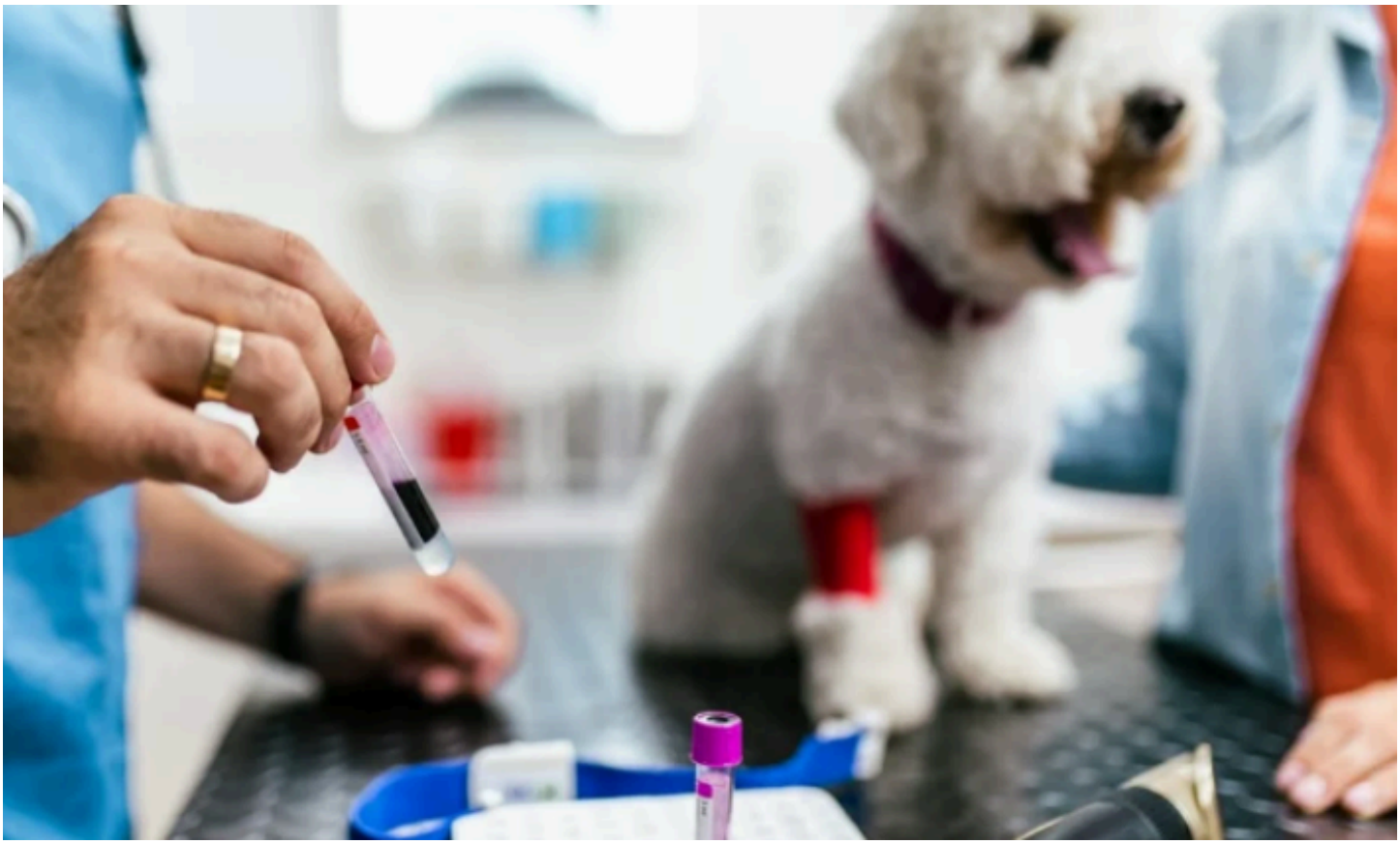
they dribble in their bed or where they're laid asleep unconsciously. It's important to check and rule out these other diseases before assuming it's CCD.

- **Confusion or Forgetfulness:** Is your dog going outside and forgetting why they asked to go? Is your dog asking for more food because they have forgotten they have been fed and watered? Are they less excited to see you, and even having a hard time recognising you? Other signs include a lack of interest in things they used to love, or forgetting basic commands. These signs often have a slow, gradual onset, and it can be difficult for you to notice as you see them every day.
- **Changes in Social Interactions:** With CCD, there can be changes in interactions between humans and with other dogs, they may be either more aloof, less interested in petting, exploring and playing, or they may seek more reassurance from caregivers as they feel more and more anxious. Dogs may also between increasingly irritable, have increased anxiety and become more aggressive; think "grumpy old man".
- **Sundowning:** Dogs and people with dementia often suffer from disturbances in their sleep-wake cycles, often in the evenings hence the term coined "sundowning". They may sleep more during the day and remain awake, disoriented, and agitated or hyperactive throughout the evening and into the night. A dog with CCD may pace or wander out of the house or garden, so it's important to make sure that gardens are dog-proof and that information on collars and microchip details are up-to-date, should a dog become lost.

Diagnosis

As mentioned, there is no specific test for canine cognitive dysfunction. It is a diagnosis of exclusion of other causes. Investigations may include some or all of the following, depending on if finances allow:

- Blood tests – biochemistry, haematology, electrolytes to check organ function.
- More specific tests, e.g. ACTH stimulation test, thyroid levels.
- Urinalysis. Urinary tract infections in people, especially caused E.Coli, can cause delirium and similar signs may be seen with dogs with bladder infections.
- Blood pressure assessment to rule out hypertension (high blood pressure).
- MRI of the brain and CSF (cerebrospinal fluids) analysis to rule out a brain tumour.



Treatment

Sadly, there is no cure for CCD, but there are ways to make them more comfortable, less anxious and hopefully slow down the progression. Geriatric patients should receive regular examinations to address nutritional needs, weight management, pain control, and to review physical and mental changes. Effective management of canine dementia may involve environmental and behavioural interventions, dietary modification, nutritional supplements, complementary therapies and pharmaceutical treatments.

1. Enrichment and Environmental Management

The home and garden environment may need to be modified to accommodate the ageing pet's needs and improve comfort.

- Older dogs may require more opportunities for toileting, either outdoors or in an indoor elimination area.

- If nocturnal waking is a problem, you can try to increase the pet's daytime exercise, play and interactions to reduce disturbances in the evening.
- Providing regular mental stimulation and enrichment e.g. with toys and games, will help maintain cognitive functioning.

- Protected resting areas and safe dens can be provided to allow geriatric pets to avoid children and other pets if they are becoming less tolerant of them.
- Training and motivators for learning may resort to approaches used for puppies, such as using high-value food rewards, tactile cues and hand signals, especially if their other senses are diminishing.
- Maintaining a regular routine can reduce anxiety.
- For senior dogs with concurrent osteoarthritis, consider memory foam mattresses, padded or non-slip surfaces for sitting and to allow traction for movement, and ramps for the car or to go up and down steps.
- Leaving night lights on to allow better visualisation can help for those with failing eyesight.

2. Nutritional Intervention and Supplements

Antioxidants: Diets containing antioxidants and omega-3 fatty acids have proven beneficial for geriatric patients e.g. **Hill's Prescription Diet b/d Canine.**

Aktivait, from VetPlus, is a nutritional supplement for dogs designed to support cognitive function, whose primary active ingredients include antioxidants and nutrients that protect brain cells, specifically Phosphatidylserine, Omega-3 fatty acids (EPA/DHA), L-Carnitine, Co-enzyme Q10, Vitamin E, Vitamin C, Alpha Lipoic Acid, and Selenium. We have seen great responses to this supplement in the early stages of cognitive dysfunction.

Medium-Chain Triglycerides: Glucose is the main energy source of neurons. However, glucose metabolism is reduced with ageing. Dietary medium-chain triglycerides (MCTs) can increase the levels of ketones in the blood, which can be used as an alternate energy source to glucose for cerebral functioning. Fatty acids derived from MCTs, such as coconut oil, could provide up to 20% of the brain's energy requirements. Long-term supplementation with MCTs has improved cognitive function in aged dogs and can be found in **Purina ProPlan Veterinary Diet NC NeuroCare** or a supplement called **Aprylic**, also from VetPlus.

3. Pharmacologic Intervention

Selegiline (Selgian): Selegiline hydrochloride is an inhibitor of the enzyme MAO-B and is approved for the control of clinical signs associated with CCD. It increases dopamine release and decreases free radical formation. Clinical trials showed selegiline to be effective in controlling clinical signs after 4 weeks of treatment with dog showing significant improvement in sleeping patterns, house-training and activity levels when compared to a placebo.

Selegiline should be given in the morning, dosed to the nearest whole tablet, with adjustments based on response and tolerance. The onset of action varies (4 to 12 weeks), and improvement may increase with extended use. Possible side effects include restlessness or agitation, vomiting, disorientation, or diarrhoea and selegiline should not be used alongside opioids, sedation, anti-depressants e.g. fluoxetine and other anxiolytics e.g. trazodone.

Propentofylline (Vivitonin): Propentofylline works by improving blood flow to the brain, circulation, oxygen supply and therefore faster clearance of waste products. It helps alleviate signs of ageing like lethargy, mental dullness, and reduced exercise tolerance, with potential improvements in alertness and vitality.

Sedatives and anxiolytics: Older pets often have anxiety-related conditions. Therefore, anxiolytic agents may also be indicated, with great care being taken about drug interactions. Drugs such as

gabapentin, trazodone and alprazolam, can be used to help settle the dog before bed, or if left alone for a period of time.

4. Complementary Therapies

Complementary therapies may include compression shirts (e.g. Thundershirts), pheromones (e.g. **Adaptil**), herbal supplements (skullcap and valerian), acupuncture, massage, or physio. **L-tryptophan** is the precursor to serotonin, the happy hormone, and **casein,** a milk protein used to appease offspring, can both be useful supplements for anxious dogs and can be found in products like **Serenicare** and **Zylkene**.

Summary

The best way to help your dog is to identify the signs of dementia early and do everything you can to support them. We would recommend completing a CADES (Canine Dementia Score) questionnaire to assess your pet's degree of impairment and then talk to us about specific treatment options that may be available for your dog.

Canine dementia itself is not fatal. However, it will often be a huge factor in the decision to say goodbye. Cognitive dysfunction will decrease a dog's quality of life when it becomes severe, so life

expectancy stages depend entirely on how much they are able to enjoy their life.

While it can be challenging to watch your dog decline, the most important thing is to love them well during this time. Unfortunately, they are likely in their final years of life, and you want them to know how loved they are, even when they might not understand and things ay be frustrating at times, especially if sleep deprivation is involved.

CAnine DEmentia Scale (CADES) (Cognitive Function Score)

	Abnormal behaviour				
	never observed	at least 1 / 6mnths	at least 1 / 1mnth	several times / 1mnth	several times a week
	0 point	**2 points**	**3 points**	**4 points**	**5 points**
A. Spatial orientation - SCORE (0–25)					
Disorientation in a familiar environment (inside/outside)					
Failure to recognise familiar people and animals inside or outside the house/apartment					
Abnormally respond to familiar objects (a chair, a wastebasket)					
Aimlessly wandering (restless during day)					
Reduced ability to do previously learned task					
B. Social interaction - Score (0-25)					
Changes in interaction a man/dog, dog/other dog (playing, petting, welcoming, increased reassurance seeking)					
Changes in individual behaviour of dog (exploration behaviour, play, performance)					
Response to commands and ability to learn new task					
Irritable / increased anxiety					
Expression of aggression					
C. House soiling - Score (0-25)					
Eliminate at home at random locations					
Eliminate in its sleeping area					
Changes in signalisation for elimination activity					
Eliminate indoors after a recent walk outside					
Eliminate at uncommon locations (grass, concrete)					
D. Sleep–wake cycles Score 0-20					
	0 points	**4 points**	**6 points**	**8 points**	**10 points**
Abnormal night time activity (wandering, vocalization, restless)					
Switch from insomnia to hypersomnia					

Total score (A + B + C + D) (0–95)

Clinical stage:
Normal ageing (Score 0–7),
Mild cognitive impairment (8–23),
Moderate cognitive impairment (24–44)
Severe cognitive impairment (45–95)

To book your senior dog in for a health check, please call us on 01423 228080 or visit www.clarohillvets.co.uk