CANINE NC NEUROCARE™

A complete dry pet food for adult and senior dogs, containing medium chain triglyceride (MCT) oil and a specific combination of nutrients proven to have a beneficial effect on brain function.

RECOMMENDED FOR & NOT RECOMMENDED FOR

- ✓ Brain function
- ✓ Age-related cognitive decline
- ✗ Not suitable during pregnancy, lactation and growth
- ✗ Conditions where a low fat diet or low protein diet is required

3 kg and 12 kg

KEY BENEFITS

Brain function
Formulated with MCTs and neurosupportive nutrients, clinically proven to help enhance canine brain function

Cognitive function
Specially formulated to help support cognitive function in senior dogs. Visible results possible in 30 days

Containing MCTs (medium chain triglycerides)
Ketogenic diet providing an alternative source of energy for the brain

ADDITIONAL BENEFITS & CHARACTERISTICS

Help nutritionally support brain metabolism
Contains a specific combination of nutrients (arginine, EPA+DHA, antioxidants, B-vitamins and selenium)

Helps support brain function
Added omega-3 fatty acids (EPA and DHA)

Helps reduce oxidative stress
Added antioxidants (vitamins C and E, selenium)

Provides an alternative source of energy for the brain, proven to support brain function
Our only canine diet to contain 6.5% added MCTs and B vitamins

COMPOSITION

Corn, dried poultry protein, wheat flour, dried salmon protein, medium chain triglycerides oil (6.5%), dried beet pulp, rice, dried egg, corn protein meal, digest, fish oil, minerals.

KEY NUTRIENT VALUES*	
Moisture	7.5%
Protein	30.0%
Fat - Medium chain triglycerides (MCTs)	15.0% 6.5%
Carbohydrates	38.5%
Crude fibre	1.5%
Crude ash	7.5%
EPA + DHA	0.4%
Vitamin E	519 IU/kg
Arginine	2.2%
Selenium	0.053 mg/100g
B vitamin	34.1 mg/100g
Metabolisable energy (ME)[1]	392 kcal/100g

* Typical analysis in the final product as fed.
[1] Calculated following NRC 2006 equations.

FEEDING GUIDELINES

PURINA® PRO PLAN® NC NeuroCare™ provides complete and balanced nutrition for adult and senior dogs to support brain function and age-related cognitive decline.

DAILY FEEDING QUANTITY		
Body weight (kg)	Adult maintenance (g/day)	Senior (g/day)
2.5	65	55
5	105	90
10	165	145
15	220	190
25	305	265
35	385	335
45	455	395
70	610	530

Water should be available at all times.

Glucose is the main obligatory energy substrate for the adult canine brain and is also very important for brain development[1].

In some special circumstances, canine brain metabolism changes, leading to reduced efficiency in utilisation of glucose as an energy source. In these situations, it is beneficial for the brain to be provided with alternative energy sources, for example in the form of fatty acids[2]. Fat is the most concentrated energy source available; however, the brain is limited in its ability to use long chain triglycerides (LCTs) as an energy source. Dietary **medium chain fatty acids (MCFAs)** from medium chain triglycerides (MCTs) can be readily oxidised to serve as an **alternate energy source (in the form of ketone bodies) for the brain** (Figure 1). MCTs are more efficiently digested and absorbed by the GI tract than LCTs, and the resulting MCFAs are more efficiently transported to the liver via the portal vein where they are converted to ketone bodies (Figure 2). Consequently diets rich in MCTs are considered more ketogenic than LCT-rich diets[2,3].

MCTs are not the only way that nutrition can support brain health. Other nutrients which support brain health in dogs include:

- Added **arginine** supports healthy circulation, blood pressure and brain function
- Added **EPA and DHA** helps support brain function and helps to maximise natural anti-inflammatory processes
- Added **antioxidants** (vitamins C and selenium) to help reduce oxidative stress
- Added **B vitamins** help with energy metabolism and DNA maintenance

FIGURE 1. ENERGY METABOLISM IN THE BRAIN.

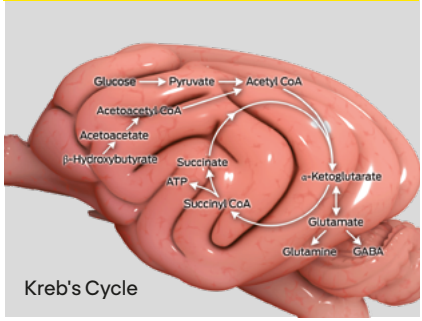
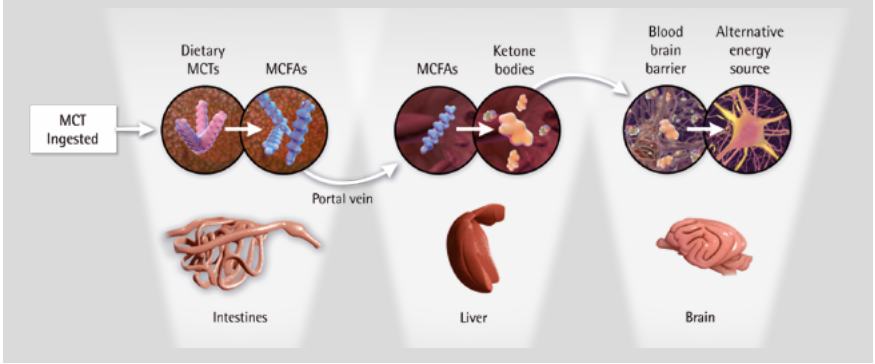


FIGURE 2. CONVERSION OF MCTS TO KETONE BODIES.



1. Mergenthaler P, *et al.* (2013) Sugar for the brain: the role of glucose in physiological and pathological brain function. *Trends Neurosci.* **36:** 587-97.
2. Galazzo IB, *et al.* (2016) Cerebral metabolism and perfusion in MR-negative individuals with refractory focal epilepsy assessed by simultaneous acquisition of 18F-FDG PET and arterial spin labeling. *NeuroImage Clinical.* **11**: 648-57.
3. Law TH, *et al.* (2015) A randomised trial of a medium-chain TAG diet as treatment for dogs with idiopathic epilepsy. *Br J Nutr.* **114**: 1438-47.

Cognitive dysfunction syndrome (CDS) is a common condition in senior dogs in which we see changes in brain metabolism. Clinical signs of these can be described as 'DISHAA' (Table 1). In a clinical study, a diet with inclusion of 6.5% MCTs and also a specific "Brain Protection Blend" – including B vitamins, antioxidants, omega-3 and arginine – was able to significantly improve all six categories of CDS signs in dogs in 90 days, with improvements in five of the categories visible after 30 days[4].

Different studies have evaluated the effects of supplementing the diet with MCT oil in epileptic humans, dogs, and rodents, and shown a significant reduction in seizure frequency with such supplementation[5].

Anticonvulsant effects of MCFAs and MCTs of various compositions have been observed in several acute rodent models.

To date, several efficacy studies in dogs with idiopathic epilepsy fed with 5.5%-6.5% added MCTs, have reported mean seizure frequency reduction[3]. All dogs in these trials were considered drug non-responders to standard anti-epileptic medications.

Remarkably, a non-blinded study evaluated a commercially available diet (PURINA® PRO PLAN® NC NeuroCare™, Nestlé PURINA®, St. Louis Missouri, USA) enriched with 6.5% MCT oil, as an adjunct to anti-epileptic drug treatment, and found a reduction in seizure frequency by 33% over a 3-month period[6].

The mechanism of action of MCTs is not clearly known, but dietary MCTs have been shown to increase mitochondrial function and metabolic synthesis of polyunsaturated fatty acids (PUFA) in the canine brain. Additionally, MCT metabolites (decanoic acids -C10), can act as an inhibitor at the AMPA receptor, promoting an anticonvulsant effect.

Diets enriched with MCTs appear to have benefits beyond epilepsy as well, as age-associated cerebral glucose hypometabolism may be correlated with age-related cognitive disorders. Some evidence suggests that mixed MCTs may provide neuroprotective effects in rodents, dogs, and people with mild cognitive impairments.

TABLE 1: SUMMARY OF KEY CLINICAL SIGNS SEEN IN CDS

D	DISORIENTATION	• Dog stares blankly at walls, floor or into space	• Gets stuck or has difficulty getting around objects	• Does not recognise familiar people
I	INTERACTION – SOCIAL RELATIONSHIPS	• Decreased interest or time spent being petted	• Spending more time alone or away from family members	• More clingy or fearful
S	SLEEP/WAKE CYCLES ALTERED	• Restless or waking at night	• Night-time vocalisation	• Sleeps noticeably more during the day
H	HOUSE SOILING, LEARNING AND MEMORY	• Decrease or loss of signalling to go out	• Decreased response to learned commands like name, tricks, etc	• Difficulty getting dog's attention/increased distraction
A	ACTIVITY ALTERED	• Decreased exploration or playing with toys	• Decreased interest in playing with family members	• Repetitive behaviours like licking, circling, chewing
A	ANXIETY	• Increased anxiety when separated from owners	• More reactive/fearful to auditory stimuli	

4 Pan Y, *et al.* (2018) Efficacy of a Therapeutic Diet on Dogs With Signs of Cognitive Dysfunction Syndrome (CDS): A Prospective Double Blinded Placebo Controlled Clinical Study. *Front Nutr.* Dec **12**;5:127.
5. Han FY, *et al.* (2021) Dietary medium chain triglycerides for management of epilepsy: New data from human, dog, and rodent studies. *Epilepsia.* **00**:1-17.
6. Molina J, *et al.* (2020) Efficacy of medium chain triglyceride oil dietary supplementation in reducing seizure frequency in dogs with idiopathic epilepsy without cluster seizures a non-blinded, prospective clinical trial. *Veterinary Record.* 187 (9).