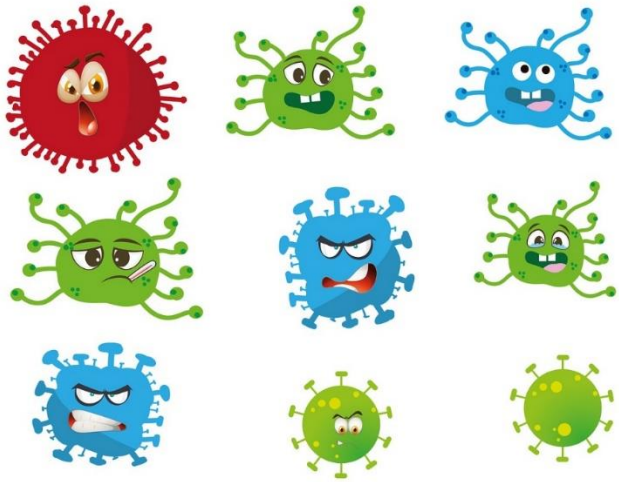
Inflammatory brain disease in dogs

Inflammatory disease affecting the nervous system in dogs can be due to infectious or immune-mediated (when your own immune defence system that usually fights diseases attacks its own body) causes.

Infectious conditions can be caused by bacterial, viral, protozoal and fungal agents; they are not very common, estimated to represent only around 10% of inflammatory brain disease. Nonetheless, it is important to undertake the necessary diagnostic tests to diagnose or rule out these conditions, as they require specific treatments.



In dogs, immune-mediated conditions are significantly more common and account for approximately **90%** of all cases of inflammatory brain disease. In a recent study undertaken here at the SATH we established that the most common condition is **MUO** (meningoencephalitis of unknown origin). Other immune-mediated causes of inflammatory brain disease include idiopathic generalized tremor syndrome (also called little shakers), eosinophilic meningoencephalitis (EME) and idiopathic hypertrophic pachymeningitis. Another very common immune-mediated condition, steroid responsive meningitis-arteritis (SRMA), which is thought to account for around one third of all nervous system inflammatory diseases, will not typically cause intracranial signs so although a very important and common condition, it is not a likely differential diagnosis in dogs presenting with signs of brain problems.

Definitive diagnosis in most of these cases would require histopathological (biopsy) examination of brain and/or spinal cord tissue and so in clinical practice, diagnosis of inflammatory CNS diseases relies on a cautious review of the clinical data and results of tests such as MRI and spinal tap.

Meningoencephalitis of Unknown Origin (MUO) in dogs

Why it happens

The cause of MUO remains undetermined despite several attempts over the years to identify a possible infectious trigger. It is suspected that there are individual genetic predispositions and a trigger factor, which could be infectious or environmental and could vary between individuals,

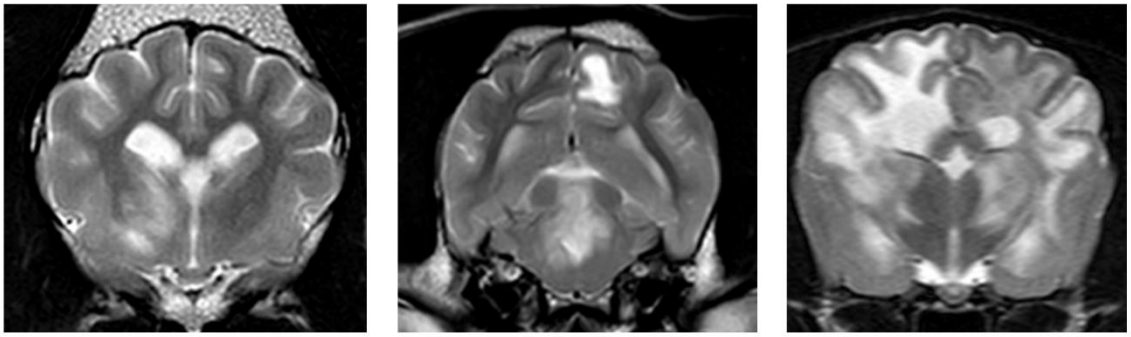
eventually initiates disease at some point during life. These conditions are not transmissible either to other dogs or to humans.

What happens

The clinical signs are variable and reflect the location of the lesions within the nervous system. On a different study undertaken at the SATH, we showed that the most common clinical signs were becoming very quiet and behaving differently than usual, wobbliness when walking, blindness in one or both eyes, the head becoming tilted to the side, seizures and walking in circles for periods of times. The signs can develop over a few hours to several weeks, but they tend to get progressively worse over time in the vast majority of dogs.

How do we diagnose it?

Conclusive diagnosis would require a brain biopsy which is very invasive, expensive and potentially can cause irreversible damage, so a clinical diagnosis is usually achieved through magnetic resonance imaging (MRI) and spinal tap. MRI usually shows bright (hyperintense) regions within the brain and/or spinal cord tissue – the range of changes is extensive with some dogs having just one site affected whilst in others, large parts of the brain show these changes, which are areas of inflammation. The images below show three different examples, showing dogs with different severity of changes.



While dogs are anaesthetised to perform the MRI, a spinal tap is usually done to collect the fluid that surrounds the brain and spinal cord (the CSF – cerebrospinal fluid) and look for inflammation. In most dogs, the spinal tap results confirm the diagnosis by showing an increased number of white blood cells and of protein in the spinal fluid but in some cases, it can be normal. In some cases, testing for infectious agents to ensure they are not causing the changes seen is also indicated.

How do we treat it?

MUO will typically show partial to full response to immunosuppressive therapies (medications that dampen down the immune system). Long-term steroid treatment (usually prednisolone) remains the cornerstone of MUO treatment, either on its own or alongside another immunomodulatory medications. A few studies have investigated the usefulness of prednisolone therapy on its own and mostly have found a good response to treatment. Many clinicians believe that administration of a second immunosuppressive agent will reduce the likelihood of relapse and help reduce the severity of the undesirable side-effects of the steroid treatment but, at present, there is no definitive evidence in support of these claims. Most used

second line medications include leflunomide, cytarabine, ciclosporin or lomustine. Radiation therapy (RT) has also been used as a treatment option alongside prednisolone. Cases treated this way did not show significant side effects and follow-up MRI showed significant improvement or even resolution of lesions a few months later, suggesting this could be a useful option, especially for cases that need rapid improvement of the clinical signs or with a history of relapse.

What is the prognosis?

Unfortunately, despite starting appropriate medication, some dogs sadly die within the first few weeks after diagnosis. Despite this, most dogs improve significantly and many have complete resolution of the clinical signs.

We have done several studies at the SATH trying to find different factors that may affect prognosis so we can identify in which patients we should treat more aggressively or monitor more closely. We have also developed a grading scale (similar to scales used to monitor comparable conditions in humans such as Multiple Sclerosis and Autoimmune Encephalitis) that can easily be calculated on examination (called the Neurodisability scale – NDS). We have shown that this scale helps determine an initial prognosis (dogs with very high scores have a worse prognosis) and also to monitor dogs during treatment.

Unfortunately, some dogs can relapse during or after stopping treatment – this means that the same signs can come back or new signs develop as inflammation can develop in different parts of the nervous system. This relapse tends to happen within 6-18 months of starting treatment but can happen at any time. It is still unknown what is the best way to avoid this but close monitoring is essential – in dogs that relapse, early return to treatment is very important.

Recent studies from the SATH Neurology team on these conditions

1. Gonçalves R, De Decker S, Walmsley G, Maddox TW (2024) Prognosis in meningoencephalitis of unknown origin in dogs: risk factors associated with survival, clinical relapse and long-term disability. JVIM 38(3): 1583-1590.
2. Ostrager A, Bentley RT, Lewis MJ, Moore GE. (2024) Survival in dogs with meningoencephalomyelitis of unknown etiology with and without lesions detected by magnetic resonance imaging. J Vet Intern Med 38, 2204-2213
3. Gonçalves R, De Decker S, Walmsley G, Maddox TW (2024) Magnetic resonance imaging prognostic factors for survival and relapse in dogs with meningoencephalitis of unknown origin. Front Vet Sci, Feb 28;11:1370882
4. Gonçalves R, Maddox TW, Phillipps S, Nagendran A, Fentem R, Orlandi R, Cooper C, Walmsley G (2023) Development of a reliable clinical assessment tool for meningoencephalitis in dogs: The neurodisability scale. JVIM 37, 1111-1118
5. Phillipps S, DeDecker S, Gutierrez-Quintana R, Alcoverro E, Gomes SA, Goncalves R (2022) Idiopathic Generalised Tremor Syndrome in Dogs. Vet Rec, Nov;191(9):e1734.
6. Gonçalves R, De Decker S, Walmsley G, Butterfield S, Maddox TW (2022) Inflammatory Disease Affecting the Central Nervous System in Dogs: A Retrospective Study in England (2010-2019). Front Vet Sci. 27, 8.