Piece of Mind

Epilepsy Fact Sheet

We understand that receiving a diagnosis of epilepsy can be overwhelming, and our aim is to empower you with knowledge and resources to help you navigate your healthcare journey.

Understanding Vagal Nerve Stimulation (VNS)

This information sheet is designed to help you understand vagal nerve stimulation (VNS), a potential treatment option for dogs with epilepsy that is not well-controlled with medication. It answers common questions based on the current scientific research. Please discuss this information thoroughly with your veterinary neurologist to determine if VNS might be a suitable option for your dog.

What is vagal nerve stimulation (VNS)?

Vagal nerve stimulation (VNS) is a non-pharmacological therapy, meaning it is a treatment that does not involve medication. It uses a small, implantable device (similar to a pacemaker) to deliver mild, regular electrical pulses to the vagus nerve in the neck. This nerve acts as a major communication pathway between the brain and the body. By stimulating it, VNS aims to calm down brain activity, potentially reducing the frequency and severity of seizures.

More recently, we have also begun investigating a non-invasive form of VNS (using a device placed on the skin of the neck) for dogs, though it is less studied than the implantable version.

Is VNS a standard treatment for epilepsy?

VNS is not yet a first-line or standard treatment for canine epilepsy. It is considered an ‘adjunctive therapy’, meaning it is an additional treatment option, typically reserved for dogs with ‘drug-resistant epilepsy’—those who continue to have seizures despite trying two or more appropriate anti-seizure medications at effective doses.

While VNS has been an established treatment for certain types of epilepsy in humans for many years, its use in dogs is still an emerging field. While promising, the evidence base is still limited.

How does VNS work to reduce seizures?

Scientists are still working to understand the exact mechanisms, but research in dogs has provided valuable insights. The leading theory is that VNS influences key chemicals (neurotransmitters) in the brain, which act as messengers that nerve cells use to communicate.

One crucial neurotransmitter is norepinephrine, which has natural anti-seizure properties. Studies in dogs have shown that VNS can increase the levels of norepinephrine in the fluid surrounding the brain and spinal cord. This increase is thought to help raise the brain's protection from having a seizure, making it less likely to trigger one.

VNS has also been shown to alter blood flow (perfusion) in certain areas of the brain, which may contribute to its anti-seizure effect.

How well does VNS work?

The research on VNS in dogs shows that it can be beneficial for some, but not all, dogs with drug-resistant epilepsy. The results vary from dog to dog.

Positive Outcomes: In a long-term study of 12 dogs with epilepsy unresponsive to medication, all seven dogs that survived for more than a year after VNS implantation experienced a sustained reduction in their seizure frequency. Three of those seven dogs even achieved seizure freedom by their last follow-up. This study reported that over 50% of the dogs had a greater than 50% reduction in seizure frequency.

Mixed Results: Another dog study performed over 13 weeks found a significant decrease (34%) in average seizure frequency during the final four weeks of active stimulation, suggesting it may take time for the full effect to develop.

Non-Invasive VNS: A pilot study on a non-invasive, handheld form of VNS found it to be feasible and safe. In this study, 9 out of 14 dogs had fewer seizures during the treatment period, with 4 dogs experiencing a 50% or greater reduction.

In summary, while some dogs can experience a dramatic improvement, others may see a more modest benefit, and some may not respond at all.

Is VNS safe?

Overall, both implantable and handheld VNS devices are well tolerated in dogs, with a favorable safety profile compared to many antiseizure medications. No severe, long-term adverse effects have been directly attributed to the stimulation itself in the published studies. However, like any procedure or treatment, there are potential side effects.

For Implantable VNS (surgical device):

Short-term/Procedure-related: During surgical device testing, some dogs may experience a temporarily slowed heart rate or even a brief pause in heartbeats (asystole). Other post-surgical complications can include a fluid buildup at the surgical site (seroma), movement of the pacemaker-like device under the skin, or mild nerve damage affecting the eye and facial muscles on one side.

Long-term: These are less common but can include hoarseness of the bark or coughing, especially during stimulation.

For Non-invasive VNS:

Reported side effects are generally mild and may include hoarse bark, limb trembling, lethargy, or behavioral changes. In rare cases, an increase in seizure frequency has been reported.

What are the limitations of VNS as a treatment?

It is important to have realistic expectations. The current research highlights several limitations:

1. Variable Response: As mentioned, the response to VNS is highly individual. There is currently no way to predict which dogs will be the best candidates.

2. Lack of Standardized Protocols: There is no consensus on the "best" stimulation parameters (e.g., current intensity, duration, frequency) to use. Different studies use different settings, making it difficult to compare results and establish a standard protocol.

3. Small-Scale Studies: Most studies on VNS in dogs have been small, with a limited number of participants. Larger, more rigorous controlled trials are needed to fully establish its effectiveness and to understand which dogs are most likely to benefit

Is the non-invasive (handheld) VNS an option for my dog?

Non-invasive VNS (using a device that stimulates the nerve through the skin) is an exciting area of development. It avoids the risks associated with surgery. The initial pilot study showed it was feasible and safe, with some dogs responding positively. However, its overall efficacy remains inconclusive, and it is not yet as widely available or studied as the implantable version.

The availability of handheld VNS devices for veterinary use is highly specific and often tied to clinical research trials rather than standard retail channels. Unlike human devices, veterinary-specific units (such as the gammaCore VET™ mentioned in studies) are typically not sold directly to the public through pet stores or online marketplaces.

The device is likely classified as an investigational or prescription-only medical device. It may not have full general release approval from regulatory bodies, specifically for canine epilepsy, meaning it is only available to veterinarians participating in approved studies.

What are the key takeaways?

The decision to pursue VNS is a significant one. Here are the main points to consider:

It’s a Promise, Not a Guarantee: VNS holds promise as a valuable additional tool for managing drug-resistant epilepsy. It can significantly reduce seizure frequency and improve the quality of life for some dogs.

It’s Not for Every Dog: A significant proportion of dogs may not benefit, and the reasons for this variability are not yet understood.

Research is Ongoing: There are still substantial gaps in our knowledge. We don't know which dogs are the best candidates, what the optimal stimulation settings are for maximizing effect while minimizing side effects, and how non-invasive and implantable VNS compares in the long term.

VNS is not a replacement for anti-seizure medication but is an additional therapy that may allow you to achieve better seizure control, potentially with fewer side effects than adding another drug. It offers a unique, neuromodulatory approach to a challenging disease.