



Dr. Rebecca Quinn and Dr. Nancy Laste of Angell's Cardiology service.

## Interventional Cardiology



by Nancy J. Laste,  
DVM, DACVIM (Cardiology)

### WHAT IS INTERVENTIONAL CARDIOLOGY?

As the name would imply, interventional cardiology refers to that subset of cardiology patients who are having some type of surgical procedure. Although this would include all patients having any type of open thoracic surgery, thoroscopic surgery or catheter-based surgery, it is most typically the term used to describe interventions performed in the cardiac catheterization laboratory.

### WHAT EXACTLY IS A CARDIAC CATHETERIZATION?

Cardiac catheterizations were commonly performed on veterinary patients with either congenital or acquired cardiac disease prior to

the development of cardiac ultrasound. While echocardiography has abolished the need for routine catheterization, cardiac catheterization remains an important diagnostic test in patients with complex congenital disease. Although it can bring important information to any patient with cardiac disease, cardiac catheterization is now generally reserved for those patients who will have a therapeutic intervention of some sort (balloon catheterization, PDA closure, etc.).

**The advances in pediatric equipment and the continued development of minimally invasive, catheter-based techniques in the past 10 years have led to greater success in a wider scope of patients with congenital heart disease than ever before.**

Cardiac catheterization is performed under general anesthesia. In patients 10 kg or larger, catheter introducers are placed in the femoral artery/vein or both vessels. (In smaller animals, the jugular vein and/or carotid artery may need to be used.) Catheter introducers allow easy exchange of different catheter types through the vessels and

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### Courtesy Consultations

We encourage our referring veterinary partners to call or e-mail our Angell specialists to consult on difficult cases.

Angell specialists are available for consultation Monday–Friday 9:00 a.m.–5:00 p.m.

Additionally, Angell emergency doctors are available for consultation on weekends and after hours (7:00 a.m.–11:00 p.m.).

Please see the back cover of this newsletter for full contact information.

or e-mail ([internalmedicine@angell.org](mailto:internalmedicine@angell.org)) Monday–Friday 9:00 am–5:00 pm. To reach an Angell internist by phone or to refer a patient to the Angell Internal Medicine service, please call Referral Coordinator Eleanor Cousino at 617 522-5011. ■

# Treatment of Autoimmune Diseases of the Central Nervous System of Dogs



by Allen Sisson,  
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## Several inflammatory, primary central nervous system (CNS) diseases of dogs have been described:

1. Granulomatous Meningoencephalomyelitis (GME)
2. Necrotizing Encephalitis of Pug, Maltese, and Yorkshire terrier dogs
3. Corticosteroid-Responsive or Neutrophilic Meningitis
4. Eosinophilic Meningoencephalomyelitis
5. Idiopathic Tremor Syndrome or Cerebellitis

It is now suspected that these idiopathic diseases are due to abnormal immune system function (an autoimmune disorder).

## Depending on where in the CNS these diseases start, they can cause a wide variety of signs such as:

1. Progressively worsening central vestibular signs
2. Progressively worsening seizures and behavior abnormalities
3. Progressively worsening neck and/or back pain
4. Progressively worsening para- or tetraparesis often mimicking a disc herniation
5. Progressively worsening generalized severe-intention tremor
6. Acute onset of blindness

These signs can progress at various rates, but they are often acute (1–2 days) to peracute (8–12 hours) in duration. In the peracute form these CNS diseases are emergencies. If rapid neurologic deterioration is noted, immediate referral to a 24-hour emergency center or aggressive immunosuppressive therapy should be started until a spinal fluid analysis and advanced CNS imaging can be done to confirm the diagnosis. Since abnormal spinal fluid can be normalized within 24 hours of starting prednisone therapy, referral for diagnostic testing as soon as possible after initiating therapy is best.

High-dose, low-term immunosuppression is the key to successful therapy for all autoimmune diseases of the CNS. For this reason it is important that infectious causes of CNS inflammation be ruled out by diagnostic testing, since immunosuppressive therapy would worsen these conditions.

Corticosteroids, primarily prednisone, are the drugs of choice and are sometimes used as the sole therapy for neutrophilic meningitis. It is important that immunosuppressive doses be used initially, and therapy be sustained at high doses, very gradually tapered over many months, or relapses are likely to occur.

Prednisone causes many adverse effects. When these adverse effects are severe, they may require the prednisone dose be reduced or even stopped and another immunosuppressive drug to be used in its place or combined with a reduced prednisone dose. In addition, when immune-mediated encephalitis or myelitis is present, it is unlikely that prednisone therapy alone can lead to permanent remission. For this reason the neurology service at Angell Animal Medical Center now treats all immune-mediated CNS diseases with combination immunosuppressive therapy.

Dogs with immune-mediated meningitis are treated with prednisone and with the immunomodulatory drug leflunomide, which is a once-daily oral medication given for one year or in some cases longer. This drug inhibits T and B lymphocyte proliferation and function and is very effective. It is a bone-marrow suppressor and requires monthly CBC monitoring and initial dose adjustment based on leflunomide blood levels. Treated this way it is rare for immune-mediated meningitis cases to relapse, with most cases achieving permanent remission and coming off of all therapy within one year.

Most dogs with GME are treated with a combination of prednisone, leflunomide and monthly cytarabine injectable therapy given over a 48-hour period. This three-drug combination leads to long-term remission in over 90% of dogs after one to 1.5 years of therapy.

Pug dogs, Maltese and Yorkshire terriers that have necrotizing encephalitis, are given a combination of prednisone, leflunomide, cytarabine lomustine and cyclosporine modified. The cytarabine and lomustine are given monthly 14 days apart, since both drugs cause leukocyte nadirs 6 to 14 days post-treatment so that they cannot be given at the same time. The use of these two chemotherapy drugs in combination requires CBC monitoring twice a month, to be sure that neutrophil and platelet numbers are adequate before each therapy. Cyclosporine modified is given BID orally and requires dose adjustment based on blood level measurement. With this five-drug therapy for 1.5 years, about 80% of dogs with necrotizing encephalitis achieve complete remission.

For more information, please visit [angell.org/neurology](http://angell.org/neurology). Angell's Neurology doctors are available for consultation via phone or e-mail ([neurology@angell.org](mailto:neurology@angell.org)) Monday–Friday 9:00 am–5:00 pm. To reach an Angell surgeon by phone or to refer a patient to the Angell Neurology service, please call Lisa Canale at 617 541-5140. ■