



## Metropolitan Veterinary Referral Group

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## Neurologist Coming to MVRG



**Veterinary Surgery Services of Northeast Ohio changes name to reflect expanded services**

Veterinary Surgery Services of Northeast Ohio is pleased to welcome Dr. Todd Axlund, DVM, MS, ACVIM (Neurology) as an addition to our growing practice. In keeping with the changing scope of the referral services offered by VSSNEO, and in honor of Dr. Axlund's arrival, the practice is changing its name. Effective August 2007, it will be known as Ohio Veterinary Surgery and Neurology, LLC.

Dr. Axlund has an extensive breadth of experience and training. While serving as a tenured associate professor at Auburn University, he has published in the veterinary literature on subjects including surgical management of atlantoaxial subluxation, hydrocephalus (see an article by Dr. Axlund on this subject in this issue), status epilepticus and pituitary dependent hyperadrenocorticism (via hypophysectomy), among others. He has lectured at the AVMA, Western Veterinary Conference, Central Veterinary Conference and ACVIM. His research results have been presented at major conferences both nationally and internationally.

We're fortunate to be able bring a neurologist to Northeast Ohio, especially one of Todd's caliber. We know that he will be a fantastic addition to our practice and that the range of diagnostic and therapeutic options he brings to Ohio will greatly improve our ability to serve the veterinary community, your clients and patients.

Dr. Axlund will officially start seeing referral appointments on Aug. 13th, 2007. Please feel free to have your clients schedule an appointment with him by calling the Ohio Veterinary Surgery and Neurology direct line (330.670.2358) or the main Metropolitan Veterinary Hospital/Metropolitan Veterinary Referral Group number (330.666.2976).

Please join us in welcoming Dr. Axlund.

## New Treatment for CHF in Dogs

by Lori Hitchcock, DVM, DACVIM (Cardiology)

Pimobendan (trade name Vetmedin) has been approved by the FDA for use in dogs for the management of mild, moderate or severe congestive heart failure due to atrioventricular valvular insufficiency or dilated cardiomyopathy. Pimobendan is a phosphodiesterase III inhibitor with similarities to its predecessors amrinone and milrinone. However, it has the added benefit of calcium sensitization. As such, it acts as both a positive inotrope and a balanced vasodilator. In simplified terms, it both strengthens the pump and decreases its workload.

Phosphodiesterase III inhibitors block the breakdown of cAMP within cardiac and vascular myocytes. As the second messenger for beta adrenergic pathways, cAMP increases intracellular calcium, resulting in increased inotropic activity (contractility) in cardiac cells and vasodilation in vascular cells in both the systemic and pulmonary circulations. The calcium sensitizing effect of pimobendan increases the sensitivity of the myofibrils to calcium also increasing cardiac inotropy. Experimentally, the effect on contractility with pimobendan is comparable to that of dobutamine, but in failing hearts the oxygen cost of the increased contractility is less with pimobendan than dobutamine. Because cAMP also is important in calcium re-uptake in cardiac myocytes, pimobendan also improves ventricular relaxation and hence diastolic function.

Several studies have shown pimobendan to be superior to ACE inhibitors in dogs with mild to severe congestive heart failure due to chronic degenerative valve disease (CVD) or dilated cardiomyopathy (DCM). The PiTCH study enrolled 105 dogs (81 DCM, 24 CVD) and randomized them in a blinded fashion to receive either pimobendan and control, benazepril and control, or a combination of the two (in addition to background therapy of furosemide). For the long-term arm, benazepril was added to therapy of the pimobendan group, but the benazepril-only group continued as such. Survival time was significantly higher in the pimobendan group at 217 days versus the benazepril group at 42 days. Another study, VetSCOPE, evaluated 76 dogs with CVD. Dogs were randomized to receive either pimobendan or benazepril in this double-blinded, positive-controlled, multicenter study. At the 56-day evaluation, dogs in the pimobendan group had a statistically significant reduction in Heart Insufficiency Score and vertebral heart size compared to the benazepril group. In the long-term study period, additional treatments could be added as needed except that dogs in the benazepril group could only receive pimobendan after being declared a treatment failure. Median survival time in the pimobendan treated group was 415 days versus 128 days in the dogs not receiving pimobendan.

Pimobendan is currently approved only for use in congestive heart failure and not in asymptomatic animals with heart disease. In one report, two asymptomatic dogs with mitral regurgitation who received long-term treatment with pimobendan developed worsening valvular regurgitation, myocardial hypertrophy and diastolic dysfunction, which improved with discontinuation of the drug. There is an ongoing study in Europe, PROTECT, to evaluate pimobendan in asymptomatic Doberman Pinschers with DCM.

Boehringer-Ingelheim, the manufacturers of Vetmedin, plan to release pimobendan in the United States as a chewable tablet in September. Until that time, pimobendan use will be limited to drugs imported from Canada after application through the FDA on a case-by-case basis.

Please do not hesitate to contact Dr. Hitchcock at Ohio Veterinary Cardiology (330.670.2376) if you have any questions regarding pimobendan.



## Future Notes

### Hear Metropolitan Veterinary Referral Group Members Presenting at Conferences

**Aug. 22-26, 2007** – Healing Oasis Wellness Center, Canada – Dr. Sivula's topic, "Basic Animal Chiropractic"

**Sept. 15-17, 2007** – Healing Oasis Wellness Center, Canada – Dr. Sivula's topic, "Advanced Craniosacral Therapy"

**Sept. 25, 2007** – Summit County Veterinary Medical Association – Dr. Axlund's topic, "Spinal Dysfunction in the Dog: Neurolocalization, Differentials and Triage"

**Oct. 6-9, 2007** – American Holistic Veterinary Medical Association – Dr. Sivula's topics, "Foundations of Animal Chiropractic" and "Canine Chiropractic Lameness Examination"

## A Note about Emergency Referrals

We are proud to offer an emergency service that is available 24/7 to help us accommodate an emergency transfer at any time. The specialty group works closely with Metropolitan Veterinary Hospital's emergency service in triaging these pets and making sure they get all the care, therapy and diagnostics they need. Please advise clients that when referred, a specialty service will be involved in the case, but some diagnostics and therapies (such as ultrasound, CT scans, and other elective diagnostics) are not routinely done on weekends or after hours unless it is an absolute emergency. As always, we appreciate a phone call about a case prior to emergency transfer so we can plan accordingly. Thank you!

## Help us Update our Mailing List

You can assist in our efforts to keep pace with the changing local veterinary population. If you are receiving copies of this newsletter for someone no longer at your practice or would like to add someone, please call Kelli Riley at 330.670.2355. Thank you!



## Contact Us

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## Specialist Spotlight

# Diagnosis and Treatment of Hydrocephalus

by Todd Axlund, DVM, MS, DACVIM (Neurology)

Hydrocephalus is a common neurologic disorder in dogs and cats. The term hydrocephalus describes the presence of an excessive accumulation of cerebrospinal fluid (CSF) within the cranial cavity with subsequent dilation of the ventricular system. In the literature, characterization of this condition has been based on anatomical location of the CSF accumulation, the pathological mechanism(s) that led to the condition and the changes in the brain that result from hydrocephalus. Internal and external hydrocephalus refers to the dilation of the ventricles and subarachnoid space respectively. Obstructive hydrocephalus refers to a physical disruption of the normal flow of CSF. Conversely, non-obstructive hydrocephalus (sometimes called “communicating”) generally refers to an abnormality of CSF absorption. Lastly, some authors will refer to hydrocephalus as “hypertensive” or “normotensive” in which CSF pressure is increased or within normal physiological parameters respectively. In a practical sense, veterinarians often simplify the characterization of hydrocephalus as either being congenital or acquired in origin.

Congenital hydrocephalus is very common in certain breeds of dogs. These breeds include the Maltese, Yorkshire terrier, English bulldog, Chihuahua, Lhasa Apso, Pomeranian, toy poodle, cairn terrier, Boston terrier, pug and Pekingese. Congenital hydrocephalus has many causes. It may be associated with an anatomical malformation such as fused rostral colliculi, secondary to a pre- or post-natal infection, or a result of fetal hypoxia during the birthing process. Acquired hydrocephalus, on the other hand, may develop from a direct or indirect obstruction secondary to a mass, tumor or inflammation in the central nervous system (CNS), senile atrophy of brain tissue in aged animals or, in rare instances, increased CSF production from a tumor of the choroid plexus.

### Clinical signs

Clinical signs in animals vary depending on the location of the pathology within the CNS, the duration of signs, and confounding factors such as recent trauma or other insult to the CNS. Restlessness, marked changes in behavior, head pressing, vestibular disease and seizures may be evident. Cerebral cortical blindness occurs with damage of the optic radiation or occipital cortex. Gait deficits in affected animals may be present and reflect the compromise of the cerebellum or brainstem. Behavior problems, however, are the most common complaint of pet

owners and may include difficulty in house training, excessive lethargy and decreased interactiveness.

### Diagnosis

Diagnosis of hydrocephalus is suspected based on physical examination and signalment. Radiographic evidence suggestive of hydrocephalus includes doming of the calvarium with thinning of cortical bone, decreased prominence of normal calvarial convolutions and persistent fontanelles. Diagnosis is better assisted by ultrasonography through the fontanelles and confirmed with advanced imaging (computed tomography and MR imaging). (Figures 1 and 2)

### Medical treatment

The treatment of hydrocephalus will be dictated by the underlying cause. In most instances, medical therapy will offer only temporary palliation of clinical signs. This is certainly true in cases of obstructive hydrocephalus where decreased CSF production will offer short-term remediation of clinical signs, but will have no primary effect for relieving the obstruction. Rarely, medical therapy can be considered long term in animals with congenital hydrocephalus when surgical drainage (shunting) of CSF is not performed.

Medical treatment of hydrocephalus decreases CSF volume and production through use of **diuretics and glucocorticoids**. All diuretics should be used cautiously, as electrolyte depletion is a common sequela. Electrolyte loss is accelerated when diuretics and glucocorticoids are combined. Monitoring sodium and potassium concentrations and hydration status is important in medically managed cases.

**Furosemide** is a loop diuretic that decreases CSF production in extracellular fluid by inhibiting the sodium-potassium cotransport system. Initially, 0.5 mg/kg to 4 mg/kg by mouth every 12 to 24 hours should be given then tapered to the lowest effective dose. **Mannitol**, an osmotic diuretic, is used in the face of rapidly decompensating hydrocephalus. A dose of 1 gm/kg to 2 gm/kg administered intravenously over 15 to 20 minutes is recommended. This may be repeated two to four times over 24 to 48 hours if needed. **Acetazolamide**, also a diuretic, decreases CSF production by inhibition of carbonic anhydrase. A dose of 10 mg/kg given orally every six to eight hours has been recommended. When combined with glucocorticoids, however, acetazolamide may cause severe potassium depletion, necessitating discontinuation.

A primary mechanism of action for various types of glucocorticoids is to decrease production of CSF. Prednisone is the drug of choice and should be administered at 0.25 mg/kg to 0.5 mg/kg orally twice daily. This dose is maintained for one month and slowly tapered to the lowest effective dose. **Dexamethasone sodium phosphate** also has been used to treat hydrocephalus, but chronic use should be avoided due to the higher incidence of side effects.

Generally, **gastroprotectants** often are used concurrently with glucocorticoids to minimize gastrointestinal side effects. **Omeprazole** is a proton-pump inhibitor that decreases stomach acidity. Although the mechanism of action is unclear, omeprazole also has been shown to decrease the production of CSF in dogs by 26 percent. A dose of 10 mg once daily for dogs less than 20 kg, and 20 mg once daily for dogs greater than 20 kg is recommended.

### Surgical treatment

Surgical shunting of CSF is indicated for obstructive disorders in which accumulation of CSF causes severe neurological deficits in animals that are refractory to medical therapies. A CSF shunt is essentially an inert catheter that is placed in the ventricular system of the brain, buried subcutaneously and emptying most commonly into the peritoneal cavity. The shunt has a control valve that only allows CSF to flow unidirectionally and at superphysiological pressures.

Depending on severity of the underlying disease process, prognosis is considered guarded to fair for patients receiving a shunt. In severe cases of hydrocephalus, neurologic improvement may be minimal. It is realistic to expect a halt in clinical deterioration and some improvement of clinical signs, but not complete resolution of neurological deficits. Reconstitution of the cerebral hemispheres after shunting occurs only in the white matter and is characterized by myelin destruction, remyelination and reactive astrocytosis. Successful outcomes, as described above, have been reported in 50 percent to 90 percent of dogs who have undergone a CSF shunt procedure. In general, animals with hydrocephalus have a better prognosis if treated early in the disease course.



Figure 1a. Transverse T2-weighted MR image of the brain of a young Chihuahua with congenital hydrocephalus. Note the enlarged lateral ventricles containing CSF (white).

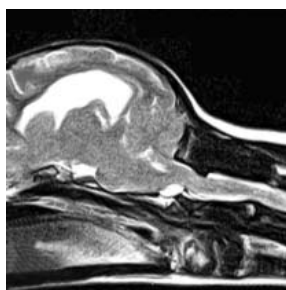


Figure 1b. Sagittal T2-weighted showing enlarged lateral ventricle.



Figure 1c. T1-weighted dorsal view showing dilated lateral ventricles. Note that the CSF appears dark in this imaging sequence.

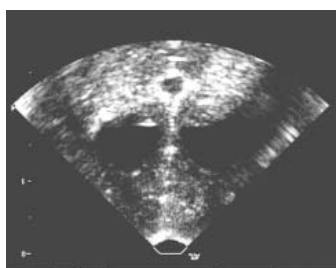


Figure 2. Ultrasound of the brain of a dog with hydrocephalus. Image was acquired by placing the probe on an open fontanelle. Note the enlarged lateral ventricles.



Figure 3a. Lateral radiograph of a dog after shunt placement. This particular shunt was placed in a dog with hydrocephalus secondary to a quadrigeminal cyst.



Figure 3b. Lateral radiograph showing the termination of the shunt in the peritoneal cavity.

## Case Study

# Ultrasound in the Diagnosis of Gallbladder Mucocele

by Dr. Rachel Bowlus, DVM, Board Eligible in Radiology, VetRad, Ltd.

A 7-year-old cocker spaniel was presented with decreased appetite and vomiting of one day duration. Serum biochemistry results revealed elevated liver enzymes. A complete blood count was normal. Abdominal ultrasound revealed immobile, stellate echogenic material in the gallbladder that resembled a kiwi fruit. The gallbladder was subjectively distended. The ultrasonographic appearance of the gallbladder was consistent with gallbladder mucocele. The gallbladder was removed surgically and gallbladder mucocele was diagnosed upon gross examination and histopathology.

Gallbladder mucocele is defined as an abnormal accumulation of mucus with distention of the gallbladder. Older small and medium-sized dogs including cocker spaniels are overrepresented. Gallbladder mucocele can be diagnosed via ultrasound due to its typical appearance of immobile, echogenic material and gallbladder distention. The echogenic material with cases of gallbladder mucocele has a range of appearances including diffusely echogenic, striated, stellate or a mixed pattern. It is more difficult to diagnose gallbladder wall rupture on ultrasound; however, signs suggestive of rupture include free fluid surrounding the gallbladder wall or gallbladder wall discontinuity. Gallbladder mucocele can be treated with medical therapy or surgical removal of the gallbladder, depending on the patient's status.

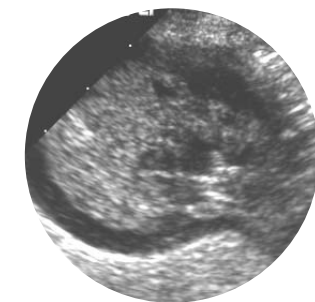


Figure 1. Ultrasound of gallbladder mucocele with mixed pattern of echogenic debris.

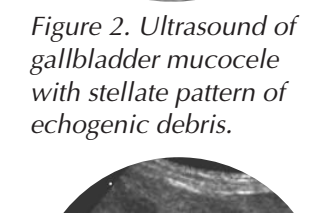


Figure 2. Ultrasound of gallbladder mucocele with stellate pattern of echogenic debris.

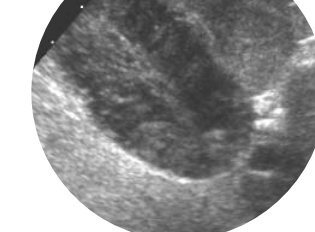


Figure 3. Ultrasound of gallbladder mucocele with striated pattern of echogenic debris (note kiwi fruit-like appearance).

## Practice Points

The doctors of **Northeast Ohio Internal Medicine Associates** know that pain can be experienced with many medical conditions in dogs and cats. In situations such as surgery, in which it is known pain will be likely, pain control is most effective when initiated prior to onset (preemptive analgesia). Early administration may decrease dosages of medications needed for pain control. Common categories of analgesic medications include nonsteroidal anti-inflammatory drugs, opioids, local anesthetics, alpha adrenergic blockers and NMDA antagonists. Many of these medications can be delivered via transdermal patches, increasing the ease and efficacy of pain control, particularly for patients that are difficult to medicate orally. If you would like to discuss pain management in your patients, Dr. Jennings and Dr. Turner are available for consultations. Call 330.670.2355.

**Dancing Dogs Animal Wellness Center** is happy to have another FDA-approved drug available for the treatment of behavioral disorders. Eli Lilly and Company now distributes Reconcile™ (fluoxetine hydrochloride) for the treatment of canine separation anxiety. Each prescription comes with Eli Lilly's BOND™, a comprehensive behavior modification program that includes a take-home DVD, printed material and in-home reminders to help clients implement appropriate training. We look forward to using this new innovation in veterinary behavior medicine to better treat and manage canine separation anxiety. Contact Dancing Dogs at 330.664.6504.

Got Digital? The radiologists at **Vet-Rad** are capable of receiving direct digital images via the Internet. If your practice is considering a switch to digital imaging or if you already have, we would love to hear from you. Meanwhile, most of our consultations are from veterinarians who use X-ray film. If your practice is interested in sending radiographs to us without making a trip to the post office, we can provide self-adhesive, postage-paid mailing labels. Just affix the label to an X-ray envelope and let your postal carrier do the rest – and we pay the postage! We also can arrange for films to be picked up at your office for overnight delivery to us. Vet-Rad can be reached at 330.670.2372.

**Ohio Veterinary Cardiology, Ltd.** sends well-wishes to Dr. Kirstin Boddy, who delivered a healthy baby girl, Kori Elizabeth, on March 26 and has decided not to return to the practice after maternity leave. The practice will have new office hours. Dr. Hitchcock will see cases Monday through Thursday. We are closed Friday through Sunday except for in-patient care and in-house emergency consults. Breaking news in cardiology is the long-awaited approval of pimobendan by the Food and Drug Administration (see related article in this issue). The manufacturer of this unique inodilator, Boehringer-Ingelheim, has announced that it intends to make a chewable tablet available in the United States beginning in September. Please contact Dr. Hitchcock at 330.670.2376 if you have any questions regarding pimobendan or for any other assistance.

**Akron Veterinary Internal Medicine and Oncology Practice** is pleased to announce that Dr. Patty Thalhofer is staying on with our practice in the position of internal medicine resident, training under Dr. Carothers and Dr. Perdion. Dr. Thalhofer has served as an intern in internal medicine and oncology over the last year and exceeded all expectations. She began her new position June 15. We also are excited to offer to our referring veterinarians the new Merial canine oral melanoma vaccine. This novel therapeutic vaccine has shown significant promise in addition to surgery and/or radiation therapy for long-term control of oral melanoma in dogs. If you have a possible patient for treatment, please contact Dr. Gamblin regarding this exciting new therapy. The practice can be reached at 330.670.2351.