Endocarditis

Endocarditis refers to inflammation of the inner surface of the heart. The medical term for the inner surface of the heart is "endocardium" and the medical term for inflammation is "it is." In dogs, this inflammation is almost always caused by infection, usually bacteria. Endocarditis is not a common disease in dogs, and it is a rare disease in cats. There are more cases diagnosed in warmer climates (specifically the Southern and Western states). Males are more commonly affected than females, and large breed dogs are affected more commonly than small. In the dog, the left-sided heart valves (aortic and mitral) are by far the most frequently affected.

How does a dog get Endocarditis?

Birth defects of the heart and its valves can predispose dogs to developing endocarditis. The most common birth defect that can lead to endocarditis is one called "subaortic stenosis," or SAS. The aortic valve in a normal dog opens when the heart beats to let blood out of the heart and into the aorta, which in turn carries the blood to the rest of the body. The aortic valve closes when the heart relaxes, like a check valve that keeps blood from flowing back into the heart, so that it continues forward at all times. Dogs with SAS have a narrowing in the area of the aortic valve. When SAS is severe, the left side of the heart can become too thick, because it has to press against a smaller opening in order to eject blood. This is similar to the way a person's muscles can get big after lifting weights regularly. When SAS is mild, you might not even know it is present, except for a quiet heart murmur that might be heard by a veterinarian on a routine exam. The narrowed area near the aortic valve in a dog with SAS can result in bacteria getting "caught" here and setting up infection. As the infection develops, a mass of bacteria and inflammatory products builds up on the valve (called a "vegetation"). As this vegetation gets bigger, it keeps the aortic valve for opening and shutting properly. As the aortic valve opens when the heart beats, blood rushing by the vegetation causes an abnormal heart sound or a "murmur." As the heart relaxes and the aortic valve tries to close, the vegetation keeps it from closing completely, and there is backflow of blood from the aorta back into the left side of the heart, which often results in left sided heart failure.

The following things can contribute to a dog with SAS developing endocarditis:

1. a bacterial infection anywhere in the body which moves to the SAS defect. Examples are dental tartar or periodontal disease, urinary tract infections, infected disc in the back, infected cuts or other injuries, etc.
2. treatment of a dog with SAS with drugs that can suppress the immune system, including cancer chemotherapy drugs, cyclosporine, and cortisone type drugs.
3. contamination of an intravenous catheter in a veterinary hospital.
4. infection after balloon valvuloplasty (a cardiac catheter procedure at a veterinary referral hospital).
5. infection or other disease which can suppress the immune system. Diabetic dogs and dogs with Cushing's Disease (overactive adrenal glands) are especially immunosuppressed and might be predisposed to endocarditis, as well as other infections.

What are the Symptoms of Endocarditis?

Fever is the most common sign, although it may be intermittent, minimal, or even absent in some patients. Other common signs of endocarditis include lethargy (poor energy), poor appetite, weight loss, reluctance to move (back pain, inflamed joints), and intermittent lameness due to muscle and joint inflammation.

The presence of heart failure when the endocarditis is found usually indicates extensive heart valve damage and these animals usually do poorly long-term. If the vegetation is in the area of the aortic valve and is very large, it can cause abnormal heart rhythm, which can result in fainting or episodes of confusion and/or weakness. This abnormal heart rhythm may be heard by your veterinarian on examination, and can be confirmed by running and EKG on the heart. Dogs with abnormal heart rhythms due to endocarditis also tend to do poorly long-term. Almost all patients diagnosed with endocarditis have a heart murmur, and dogs with aortic endocarditis often have a particular kind of heart murmur, called a "to and fro" murmur or a "diastolic" murmur. The "to and fro" murmur is named so because the heart murmur has two parts – one noise as the blood rushes out of the heart past the vegetations while the heart is contracting, and the other as the blood back-flows past the vegetation again back in to the heart, as the heart relaxes. A "diastolic" murmur occurs when an abnormal heart sound is heard only during the backflow during heat relaxation. "Diastole" is the medical term for the period of time between heart beats when the heart muscle is briefly relaxing.

The heart murmur may be new at the time endocarditis is diagnosed, or may be newly recognized because of changes in intensity, quality, timing, or duration. Many animals with endocarditis have a preexisting heart murmur, e.g., from mild subaortic stenosis. The presence of a diastolic or "to and fro" murmur in a systemically ill animal should dramatically raise the index of suspicion for infective endocarditis. These murmurs of aortic insufficiency are often low intensity, soft, blowing murmurs with a distant quality that makes them difficult to hear in noisy clinical environments. They are often heard best by placing the diaphragm of the stethoscope in the animal's left armpit with the animal lying on it's left side, such that the animal is actually lying on top of the stethoscope.

How is Endocarditis Diagnosed?

Because signs and symptoms of endocarditis tend to be vague and are sometimes associated with other illness, endocarditis is often difficult to diagnose.

The following preliminary test results can suggest that we need to look for endocarditis:

1. high white count and mild anemia in a dog with a new heart murmur
2. urinary tract infection or a great deal of protein in the urine of a dog with a new heart murmur
3. history of a heart murmur at a young age, especially if it has been confirmed to be causes by SAS

The following tests can more specifically identify endocarditis:

1. actually seeing the endocarditis "vegetation" when examining the heart and its valves with ultrasound.
2. at least two positive blood cultures (same organism) in the presence of a new heart murmur.
3. confirmed backflow of blood across the aortic valve, using color Doppler ultrasound.

e hasn't already done so. Validated serologic testing for *Bartonella* sp. is available from NCSU by contacting Dr. Edward Breitschwerdt's laboratory, e-mail Julie_Bradley@ncsu.edu for specific sample preparation, mailing, and billing instructions.

How is Endocarditis Treated?

The best chance for survival in a dog with endocarditis is referral to a Veterinary Cardiologist who has an ICU in his or her hospital. These infections are difficult to treat even under the most ideal circumstances.

Treatment begins with administration of IV antibiotics, at least until fever subsides (if present), heart failure is under control, and the dog is eating reasonably well. This usually requires about 2-5 days. Then the dog is sent home, to be given antibiotic injections for a few days if possible, and then oral antibiotics for at least 12 weeks, and maybe much longer. Usually, we begin treatment with two antibiotics called Baytril and a penicillin. We change this therapy only if culture of the blood or urine or blood tests for a particular infectious organism such as *Bartonella* indicate that we need to change therapy.

What is the Prognosis for a dog with Endocarditis?

Those dogs who respond very well to antibiotic treatment within a day of two of starting it tend to do better than those who do not.

As mentioned before, dogs who have congestive heart failure or abnormal heart rhythm along with endocarditis tend to do poorly long term. IF there is a great deal of damage to the heart valve at the time that treatment begins (indicated by heart failure), this means that treatment will be much more difficult. As well, dogs who have kidney failure along with endocarditis tend to do poorly long term. The reason for dogs with kidney failure and endocarditis do poorly is that the treatment for one can make the other worse. Dogs with heart failure need diuretics and fluid restriction because they already have too much fluid in their lungs. But fluid restriction can make kidney failure much worse. ON the other hand, dogs with kidney failure need lots of IV fluids to flush the toxins from the blood that are normally removed by the kidneys. However, giving a dog with heart failure IV fluids is very dangerous, as their heart can not effectively pump it out of the lungs. Giving aggressive IV fluids to dogs with endocarditis who are not yet in heart failure can possibly send them into heart failure. Dogs with endocarditis can get kidney failure for several reasons. First, the bacteria that infects the heart can also infect the kidneys. And second, 25% of the blood that leaves the heart is delivered to the kidneys – the kidneys need a generous blood supply in order to do their job. But when a dog is in heart failure, the kidneys may not receive as much blood supply as the need, contributing to kidney failure over time.

It is often not possible to totally eliminate the heart valve infection, so that dogs with endocarditis often have to stay on antibiotics for a minimum of several months, usually for the rest of their lives. If we can just keep the vegetation from growing, or even perhaps shrink it, we might be able to control the heart failure for weeks to months. Occasionally,

dog with severe endocarditis survive for less than a week after diagnosis, even with the most aggressive treatment. It is rare for dogs with endocarditis to survive years, though with careful therapy at a referral center with ICU, cure of endocarditis has been achieved on occasion. If we are lucky enough to eliminate the endocarditis infection, we usually still have to treat heart failure for life, due to heart valve damage caused by the endocarditis.

Complications can occur in a dog with endocarditis if pieces of the vegetation break off of the heart valve and travel to other parts or the body, where they can block blood supply and cause inflammation. This happens most commonly to the spleen, liver, kidney and skin in the dog. This process is called "embolization." Embolization of the spleen can cause severe and sudden pain in the belly. Embolization of the liver and kidney can cause failure in those organs. Embolization of the skin can cause large and deep sores on the skin. Occasionally, embolization of an endocarditis vegetation can cause stroke or paralysis in a dog.

Because endocarditis infections are long standing and deep seated, they can result in inflammation in other parts of a dog's body. Muscles and joints can become sore from time to time, and back pain can develop if a vertebral disc becomes infected.

If your dog initially responds well to treatment, it is VERY IMPORTANT to continue antibiotics until your veterinarian tells you to stop. If the infection returns, further damage to the heart valve can occur quickly, and it is usually irreversible. If blood or urine cultures are initially positive, it is very important to do the recommended follow-up cultures, to make sure we are keeping infection under control.