O A K B A Y A N I M A L H O S P I T A L
975 OAK BAY ROAD, PORT HADLOCK, WASHINGTON 98339 • PHONE: 360.385.7297 • FAX: 360.379.8124

CANINE DILATED CARDIOMYOPATHY AND HEART FAILURE

Briefly, how does the heart work?
The heart has four chambers. The upper chambers are called atria (singular: atrium), and the lower chambers are called ventricles. In addition to the upper and lower chambers, the heart is also considered to have a right and a left side.

Blood flows from the body into the right atrium. It is stored there briefly, then pumped into the right ventricle. The right ventricle pumps blood into the lungs, where it receives oxygen. It flows from the lungs into the left atrium; it is held here briefly before going into the left ventricle. The left ventricle contains the largest muscle of the heart so the blood can be pumped out to all parts of the body.

What is dilated cardiomyopathy?
Dilated cardiomyopathy means that the heart muscle, especially the thick muscle wall of the left ventricle, becomes much thinner than normal. The pressure of the blood inside the heart then allows this thinned wall to stretch, resulting in a much larger left ventricular chamber. Therefore, the two characteristics of dilated cardiomyopathy are a heart wall that is much thinner than normal and a chamber that is much larger than normal.

How common is dilated cardiomyopathy?
Dilated cardiomyopathy is not the most common cause of heart failure in dogs in general. However, this is the most common cause of heart failure in *large breeds* of dogs. Small breeds are only occasionally affected. The most commonly affected breeds are Boxers, Doberman Pinschers, and Great danes. Occasionally, medium sized breeds, notably Cocker Spaniels and English Springer Spaniels, are also affected.

Are there any signs of heart failure which would be noticeable to me?
When the heart is not properly pumping, blood backs up into the vessels of the lungs. Increased pressure within the vessels results in small amounts of fluid leaking out of the capillaries and eventually into the air passageways. This fluid collection in the lungs produces coughing and/or gagging, the most obvious sign of heart failure. Dogs in heart failure also tire very easily from minimal exercise.

Congestive heart failure begins when the heart is not able to provide blood with adequate oxygen to the tissues. Without adequate oxygen, the body's cells become desperate and trigger a series of responses. Various hormones are released by several organs in an attempt to correct the problem. These hormones conserve fluid in an effort to increase blood volume and the output of blood and oxygen by the heart.

For several months, these compensatory responses help the situation. However, increased fluid retention eventually becomes harmful. More and more fluid leaks out of capillaries, causing increased gagging and coughing, and reduced stamina. Fluid may collect in the abdominal cavity and body tissues. Fluid in the lungs is called pulmonary edema, fluid below the skin is called peripheral or limb edema, and fluid in the abdomen is called ascites. Congestive heart failure is a common cause of these signs.

My dog seemed to get very ill just in the last day or two. How can this happen?

Dilated cardiomyopathy develops over many months or even years. Its effects on blood flow also develops slowly. As heart function declines, the body is able to compensate for several weeks or months. However, at some point in time, the body's ability to compensate is no longer effective. At that point, dogs go into severe heart failure in what appears to be a matter of hours. Rapid, heavy breathing, a blue tongue, excessive drooling, or collapse may be the first signs.

What tests are done to assess the situation?

There are several tests that are used. All provide valuable information while looking at different aspects of heart function.

1. **Listening with a stethoscope (auscultation).** This valuable tool allows us to identify murmurs, their location and intensity, an abnormal heart rhythm (arrhythmia) and it also allows us to hear lung sounds. This aids in our understanding of what is happening within the lungs.

2. **Blood and urine tests.** These do not give direct information about heart function, but they allow us to understand other disorders in the body that may impact on heart function and treatment of heart disease.

3. **Chest radiographs (x-rays).** These give us the best look at the lungs and a view of the size and shape of the heart. In most cases, dilated cardiomyopathy causes tremendous enlargement of the heart. These changes are usually very apparent on the x-rays.

4. **Electrocardiogram (ECG or EKG).** This is an assessment of the electrical activity of the heart. It allows us to accurately determine heart rate and to more accurately identify any arrhythmias which might be present.

5. **Ultrasound examination (Sonogram, Echocardiogram).** This examination uses sound waves which bounce off the structures of the heart and are read on a TV-like monitor. It gives the most accurate determination of the size of each heart chamber, and permits measurement of the thickness of the heart walls. This is seen on the monitor in actual time so the contractions of the heart can be evaluated. Certain measurements can be taken which allow the actual strength of the heart's contraction to be measured as a number and compared to the normal animal. Ultrasound may not be available in all private veterinary practices because of the additional training needed to learn how to perform the examination and because of the cost of the equipment.

The combination of all of these tests gives us our best evaluation of the dog and its heart function. However, if cost considerations prohibit us performing all of them, two or three will provide valuable information.

Is there a treatment for heart failure caused by dilated cardiomyopathy?

If the dog has a sudden onset of heart failure, rapid administration of the proper drugs is essential to survival. The following drugs may be used at various stages of treatment. Initial stabilization usually depends on the first two.

1. **Diuretics.** These drugs stimulate the kidneys to remove excess fluid from the body. Furosemide is most commonly used, although others will be selected in certain circumstances.

2. **Nitroglycerin.** This drug is called a venodilator; it dilates the veins throughout the body, especially the ones going to the heart muscle. It decreases the amount of blood returning to the heart by allowing some of it to "pool" in the veins. This takes some of the workload off the heart. This drug can be very useful for treating pulmonary edema, but it is only effective for a few days.

3. **Digitalis.** This drug improves heart function in several ways. It regulates excess hormones that have been released, slows the heart rate, and strengthens each contraction of the heart.

4. **Enzyme blockers.** This is a relatively new class of drugs which can directly block the compensation system that has gotten out of control.

5. **Vasodilators.** These drugs dilate the arteries and/or the veins of the body so that the heart doesn't have to generate as much pressure to eject blood. They may be used long-term because they continue to be effective, as opposed to the short-term effects of nitroglycerin.

6. **Carnitine.** A few dogs, especially Boxers, have a deficiency of this amino acid. This deficiency causes cardiomyopathy, and the administration of it will greatly improve heart function and even reverse the heart abnormalities. However, it is an expensive drug to give to large dogs, so it is not used unless its deficiency can be documented with blood tests.

7. **Taurine.** Some Cocker Spaniels have a form of cardiomyopathy that is due to a deficiency of this amino acid. Administration of taurine to these dogs can reverse many of the changes to the heart. There is no reliable blood test to predict which dogs will respond, so a therapeutic trial is appropriate.

How much longer will my dog live?

There are many factors that must be considered before that question can be answered. The results of the tests are important, and the response that occurs within the first few days is another indicator.

If response does not occur within a few hours to days, the prognosis is not good. However, most dogs that stabilize quickly will live for a period of a few months to many months, but the long-term prognosis is not good. It can be difficult to generate an accurate estimate for life-expectancy when a dog has heart disease because many variables impact on survival.