



# Right-Sided Congestive Heart Failure

## Basics

### OVERVIEW

- Failure of the right side of the heart to pump blood at a sufficient rate to meet the needs of the body or to prevent blood from pooling within the veins of the body
- The heart of the dog or cat is composed of four chambers; the top two chambers are the right and left atria and the bottom two chambers are the right and left ventricles; heart valves are located between the right atrium and the right ventricle (tricuspid valve); between the left atrium and the left ventricle (mitral valve); from the right ventricle to the main pulmonary (lung) artery (pulmonary valve); and from the left ventricle to the aorta (the main artery of the body; valve is the aortic valve)
- The right side of the heart consists of the right atrium and the right ventricle

### GENETICS

- Some congenital (present at birth) heart defects have a genetic basis in certain breeds
- A heart-muscle disease of the right ventricle accompanied by irregular heartbeats (known as “arrhythmogenic right ventricular cardiomyopathy” or ARVC) appears to have a genetic basis in boxers

### SIGNALMENT/DESCRIPTION OF PET

#### Species

- Dogs
- Cats

#### Breed Predilections

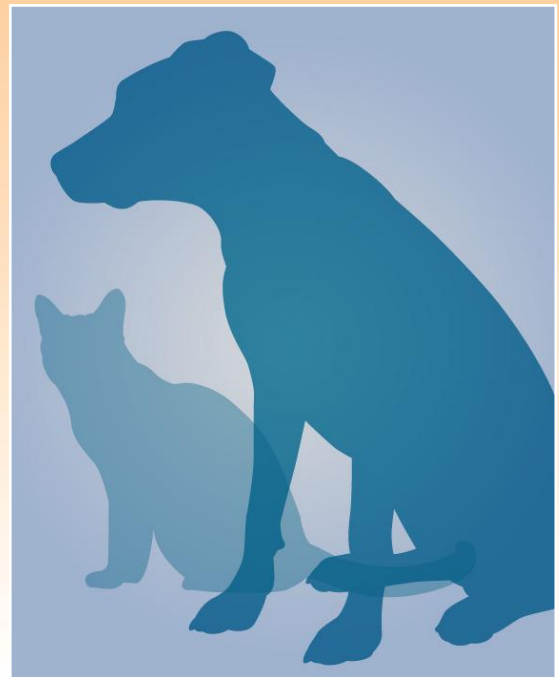
- Vary with cause

#### Mean Age and Range

- Vary with cause

#### Predominant Sex

- Varies with cause



## **SIGNS/OBSERVED CHANGES IN THE PET**

- Signs vary with underlying cause
- Signs vary with the species involved
- Weakness
- Sluggishness (lethargy)
- Exercise intolerance
- Abdominal enlargement or distension
- Difficulty breathing (known as “dyspnea”), rapid breathing (known as “tachypnea”)
- Enlargement or distention of the jugular vein; the jugular veins are located on either side of the neck; they are the main blood vessels through which blood is returned from the head to the heart
- Pulsation may be detected in the jugular veins (known as a “jugular pulse”) in some pets
- Enlarged liver (known as “hepatomegaly”)
- Fluid buildup in the abdomen (known as “ascites”) is common in dogs and rare in cats with right-sided congestive heart failure
- Fluid buildup in the space between the lungs and chest wall (known as “pleural effusion”) without fluid buildup in the abdomen (ascites) and liver enlargement (hepatomegaly) is rare in dogs with right-sided congestive heart failure
- Fluid buildup in the abdomen (ascites) without fluid buildup in the space between the lungs and chest wall (pleural effusion) is rare in cats with right-sided congestive heart failure
- Possible heart murmur may be heard when listening to the heart with a stethoscope
- Muffled heart sounds may be heard when listening to the heart with a stethoscope, if the pet has fluid buildup in the space between the lungs and chest wall (pleural effusion) or in the space between the heart and the sac surrounding the heart (the sac is the “pericardium;” condition known as “pericardial effusion”)
- Weak femoral pulses
- Rapid, shallow breathing, if the pet has fluid buildup in the space between the lungs and chest wall (pleural effusion) or severe fluid buildup in the abdomen (ascites)
- Fluid buildup in the tissues, especially the legs and under the skin (known as “peripheral edema”) is infrequent

## **CAUSES**

### **Pump (Myocardial) Failure of the Right Ventricle**

- Heart muscle is flabby and weak for unknown causes (so-called “idiopathic dilated cardiomyopathy” or DCM)
- A heart-muscle disease of the right ventricle accompanied by irregular heartbeats (arrhythmogenic right ventricular cardiomyopathy)
- Trypanosomiasis (disease caused by the protozoa, *Trypanosoma*)
- Toxicity of doxorubicin (a chemotherapeutic drug) to the heart
- Long-term (chronic) excessive levels of thyroid hormone (known as “hyperthyroidism”)

### **Volume Overload of the Right Ventricle**

- Long-term (chronic) mitral and/or tricuspid valve disease (known as “endocardiosis”); the “mitral valve” is the heart valve between the left atrium and the left ventricle; the “tricuspid valve” is the heart valve between the right atrium and the right ventricle
- Abnormal development of the tricuspid valve (known as “tricuspid valve dysplasia”); the “tricuspid valve” is the heart valve between the right atrium and the right ventricle

### **Pressure Overload of the Right Ventricle**

- Heartworm disease
- Long-term (chronic) obstructive lung disease, with high blood pressure in the lungs (known as “pulmonary hypertension”)
- Blood clots to the lungs (known as “pulmonary thromboembolism”)
- Narrowing of the pulmonary valve (known as “pulmonic stenosis”); the “pulmonary valve” is the heart valve from the right ventricle to the main pulmonary (lung) artery
- Tetralogy of Fallot, a set of birth defects in the heart
- Tumor in the right ventricle
- Primary high blood pressure in the lungs (pulmonary hypertension)

## **Impediment to Blood Filling of the Right Ventricle**

- Fluid buildup between the heart and the sac surrounding the heart (pericardium; condition is pericardial effusion) with resulting compression of the heart (known as “tamponade”)
- Inflammation of the sac surrounding the heart (pericardium) with thickening and scarring, such that it restricts filling of the heart with blood as the ventricles cannot expand normally (known as “constrictive pericarditis” or “restrictive pericarditis”)
- Tumors or masses in the right atrium or vena cava; the “vena cava” is the main vein that returns blood from the body to the heart
- Narrowing of the tricuspid valve (known as “tricuspid stenosis”); the “tricuspid valve” is the heart valve between the right atrium and the right ventricle
- Cor triatriatum dexter, a birth defect of the heart

## **Heart Rate or Rhythm Disturbances**

- Slow heart rate (known as “bradycardia”), generally due to a complete heart block
- Rapid heart rate (known as “tachycardia”) and/or rapid, irregular heartbeats (known as “tachyarrhythmias”)

## **RISK FACTORS**

- No heartworm preventive medication or lack of routine administration of heartworm preventive medication
- Offspring of pet with right-sided congenital (present at birth) heart defect
- Conditions causing long-term (chronic), high blood volume being pumped by the heart (known as “high cardiac output”), such as excessive levels of thyroid hormone (hyperthyroidism), low red blood cell count (known as “anemia”), and pregnancy

# **Treatment**

## **HEALTH CARE**

- Most pets treated as outpatients, unless having difficulty breathing (dyspnea) or collapse
- Tapping the chest to remove excess fluid (known as “thoracentesis”) and tapping the abdomen to remove excess fluid (known as “abdominocentesis”) may be required periodically for pets no longer responsive to medical management or for those with severe difficulty breathing (dyspnea) due to fluid buildup in the space between the lungs and chest wall (pleural effusion) or in the abdomen (ascites)

## **ACTIVITY**

- Restrict activity

## **DIET**

- Restrict sodium moderately
- Severe sodium restriction is indicated for pets with advanced disease

## **SURGERY**

- Surgery may benefit selected pets with congenital (present at birth) defects, such as those with narrowing of the pulmonary valve (known as “pulmonic stenosis”); the “pulmonary valve” is the heart valve from the right ventricle to the main pulmonary (lung) artery
- Tapping and draining the space between the heart and the sac surrounding the heart (pericardium; procedure known as “pericardiocentesis”) or surgically removing the pericardium (known as “pericardectomy”) in pets with fluid buildup (pericardial effusion)

# **Medications**

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

- Drugs should be administered only after a definitive diagnosis is made

## **MEDICATIONS TO REMOVE EXCESS FLUID FROM THE BODY (KNOWN AS “DIURETICS”)**

- Furosemide or another “loop diuretic” is the initial diuretic of choice; diuretics are indicated to remove fluid buildup
- Spironolactone increases survival in people with heart failure because of its ability to block aldosterone (a hormone produced by the adrenal gland; involved in sodium and potassium regulation in the body); use in combination with furosemide
- Thiazide diuretics can be added to furosemide and spironolactone in heart failure cases that do not respond to these medications

## **DIGOXIN**

- Digoxin is used in pets with heart-muscle failure (such as dilated cardiomyopathy, a disease characterized by a flabby, weak heart muscle)
- Digoxin also is indicated to treat certain abnormal or irregular heart rhythms that start in heart tissue above the ventricles (known as “supraventricular arrhythmias”) in pets with congestive heart failure

## **ANGIOTENSIN CONVERTING ENZYME (ACE) INHIBITORS (TYPE OF HEART MEDICATION)**

- ACE inhibitor, such as enalapril or benazepril, is helpful in dilated cardiomyopathy (disease characterized by a flabby, weak heart muscle) and long-term (chronic) mitral and/or tricuspid valve disease; the “mitral valve” is the heart valve between the left atrium and the left ventricle; the “tricuspid valve” is the heart valve between the right atrium and the right ventricle

## **PIMOBENDAN**

- Calcium sensitizer that enlarges or dilates arteries (known as “arterial vasodilation”) and increases heart-muscle contraction
- Especially useful in heart-muscle failure

## **OTHER MEDICATIONS**

- Potassium supplementation, if low levels of potassium in the blood (known as “hypokalemia”) are documented; use potassium supplements cautiously in pets receiving an angiotensin converting enzyme inhibitor or spironolactone
- Treat irregular heartbeats (known as “arrhythmias”), as needed
- Taurine supplementation in cats with dilated cardiomyopathy (disease characterized by a flabby, weak heart muscle) and dogs with dilated cardiomyopathy and taurine deficiency (such as American cocker spaniels); taurine is an amino acid (protein) that is an important component of the diet of cats; cats cannot produce enough taurine in their bodies and so, must obtain taurine from their food to maintain the health of several organs, including the heart; dogs may be affected by inadequate levels of taurine as well
- L-carnitine supplementation may help some dogs with dilated cardiomyopathy (disease characterized by a flabby, weak heart muscle), such as in cocker spaniels and boxers

## **Follow-Up Care**

### **PATIENT MONITORING**

- Monitor kidney status, electrolytes, hydration, breathing rate and effort, body weight, and abdominal girth (dogs)
- If excess levels of urea and other nitrogenous waste products in the blood (known as “uremia” or “azotemia”) develop, reduce the dosage of diuretic, as directed by your pet's veterinarian; if azotemia persists and the pet also is on an angiotensin converting enzyme inhibitor, reduce or discontinue the ACE inhibitor, as directed by your pet's veterinarian
- Use digoxin with caution if excess levels of urea and other nitrogenous waste products in the blood (azotemia) develop

- Monitor electrocardiogram (ECG, a recording of the electrical activity of the heart) if irregular heartbeats (arrhythmias) are suspected
- Check digoxin concentration in the blood periodically

### **POSSIBLE COMPLICATIONS**

- Blood clots in the lungs (pulmonary thromboembolism)
- Irregular heartbeats (arrhythmias)
- Electrolyte imbalances
- Digoxin toxicity
- Excess levels of urea and other nitrogenous waste products in the blood (azotemia) and kidney failure

### **EXPECTED COURSE AND PROGNOSIS**

- Prognosis varies with underlying cause

### **Key Points**

- Failure of the right side of the heart to pump blood at a sufficient rate to meet the needs of the body or to prevent blood from pooling within the veins of the body
- Some congenital (present at birth) heart defects have a genetic basis in certain breeds
- Right-sided congestive heart failure is not curable, with few exceptions (such as pets with heartworm disease, irregular heartbeats [arrhythmias], excessive levels of thyroid hormone [hyperthyroidism], and fluid buildup in the space between the heart and the sac that surrounds the heart for unknown cause [so-called “idiopathic pericardial effusion”])
- Most pets improve with initial treatment but often have recurrent heart failure

## **TinyBear Pomeranians**

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