



---

## Animal Specialty Hospital of Florida

---

*Exceptionally skilled. Uniquely compassionate.*

### Cardiac Drug and Supplement Information:

Nick Schroeder, DVM DACVIM (cardiology)

Cardiac drugs are used in patients at high risk for or suffering from congestive heart failure. Different types of drugs may be used in any given patient for a variety of reasons. The main classes of drugs include diuretics, antihypertensives, positive inotropics/inodilators, antithrombotics and antiarrhythmics. Supplements are occasionally advocated for use in patients with heart disease as well. The following information covers only the most commonly used drugs in each class, and by no means is a comprehensive review. It is very important that all cardiac drugs intended for use in dogs in cats are placed out of the reach of children and are not to be taken by human beings. If accidental ingestion occurs, please seek immediate medical attention and/or contact a poison control center. Discontinuation or changes in the doses of these medications in pets suffering from heart failure should be supervised by a veterinarian.

#### **DIURETICS:**

There are three classes of diuretics commonly used in small animals for the treatment of congestive heart failure. These include loop diuretics, potassium-sparing diuretics and thiazide diuretics. Each type acts on the kidney in a specific way to increase urine production. This decreases the total blood volume the failing heart has to deal with, allowing for the reabsorption of fluid accumulation. Some diuretics have hormonal effects. Combination drugs are also available. Overzealous use may lead to dehydration and electrolyte loss. Patients taking diuretics should have bloodwork performed periodically to monitor for potential problems. Patients taking multiple diuretics should be monitored closely at home for any problems, and suspension of therapy may be advised if patients quit eating or start vomiting.

#### **Furosemide (LASIX®, SALIX®):**

To prevent excessive retention of fluid, diuretic drugs such as furosemide are often used in the face of heart failure. **THIS IS THE MOST IMPORTANT DRUG PATIENTS SUFFERING FROM HEART FAILURE WILL TAKE.** A loop diuretic, this drug prevents the absorption of chloride, sodium, potassium and water, leading to an increased volume of urine. This assists the kidneys in removing excessive fluid. It is a potent diuretic drug used to reduce fluid accumulation and prevent further edema. Adverse effects include electrolyte disturbances, low blood potassium and dehydration. Kidney function should be monitored when using this medication.

#### **Torsemide (DEMADEX®):**

To prevent excessive retention of fluid, diuretic drugs such as torsemide are often used in the face of heart failure. A loop diuretic, this drug prevents the absorption of chloride, sodium, potassium and water, leading to an increased volume of urine. This assists the kidneys in removing excessive fluid. It is a VERY potent diuretic drug used to reduce fluid accumulation and prevent further edema. Adverse effects include electrolyte disturbances, low blood potassium and dehydration. Kidney function should be monitored when using this medication. Discontinue this medication if your pet stops eating or starts vomiting, and notify your veterinarian immediately.

#### **Spironolactone (ALDACTONE®):**

Spironolactone is a potassium-sparing diuretic drug that inhibits the activity of the hormone

aldosterone. This hormone is released in great quantity in heart failure. Overall, the diuretic effect is mild. Spironolactone also blocks the adverse effects of aldosterone on the heart muscle. High concentrations of aldosterone are toxic to the heart. Adverse effects associated with spironolactone are few and typically mild. They generally subside once the drug is discontinued. Some adverse effects associated with spironolactone include dehydration, low blood pressure, high blood potassium, lethargy, vomiting and diarrhea.

**Hydrochlorothiazide (THIURETIC®, ESIDRIX®, HYDRODIURIL®):**

Hydrochlorothiazide is a diuretic drug occasionally used to treat congestive heart failure. It is typically used in combination with other diuretics if fluid retention on furosemide (LASIX®) alone is uncontrolled. Thiazide diuretics can cause low blood potassium and sodium levels, leading to weakness, lethargy and inappetence. Careful monitoring of electrolytes is necessary, and is done with periodic blood testing.

**Spironolactone/hydrochlorothiazide (ALDACTAZIDE®):**

Aldactazide is a combination diuretic drug that inhibits the activity of the hormone aldosterone. This hormone is released in great quantities in heart failure. Aldactazide also blocks the adverse effects of aldosterone on the heart muscle. The thiazide component of this drug enhances the diuretic effects. Adverse effects are uncommon. They generally subside once the drug is discontinued. Some adverse effects associated with Aldactazide include dehydration, low blood pressure, blood salt (electrolyte) disturbances, lethargy, vomiting and diarrhea.

**ANTIHYPERTENSIVES:**

Antihypertensive drugs lower the blood pressure. They are commonly used as adjunctive therapy in patient suffering from congestive heart failure. They may be used in patients that have overt high blood pressure (*systemic hypertension*). Some are used specifically for patients with elevated blood pressure in the lungs (*pulmonary hypertension*). There are a few different types of antihypertensive drugs. Angiotensin-converting enzyme inhibitors (ACE-inhibitors) are commonly used in patients with congestive heart failure. Calcium channel blockers may also be used in patients with systemic hypertension. Occasionally, direct-acting vasodilators are used in cases of severe heart failure or systemic hypertension. Phosphodiesterase inhibitors may be used in patients with pulmonary hypertension. Periodic monitoring of the blood pressure is advised, especially if high doses are used to control severe hypertension. Generally, if a patient taking an antihypertensive drug suddenly becomes very weak, lethargic, or collapses, then it is advisable to discontinue the drug and notify the veterinarian immediately.

**Enalapril (ENACARD®, VASOTEC®):**

**Benazepril (LOTENSIN®):**

Enalapril and benazepril belong to a general class of drugs known as angiotensin converting enzyme inhibitors (ACE-inhibitors). These drugs decrease the formation of compounds and hormones that constrict blood vessels in animals with heart and vascular disease. The ACE-inhibitors are classified as vasodilators because of their relaxing effect on blood vessels. These drugs also reduce the concentrations of harmful chemicals and hormones that injure heart muscle in animals with heart failure. Enalapril and benazepril may relax blood vessels to such a degree that some animals become weak from low blood pressure. Kidney function should be monitored when using this medication. If this is a new medication for your pet a blood profile must be checked in 1-2 weeks before the dose is increased to twice a day in dogs (cats typically receive the medication no more than once daily). Do not combine with non-steroidal anti-inflammatory drugs (NSAIDS) such as aspirin, Deramaxx®, Metacam®, Rimadyl®, or Etogesic®.

**Amlodipine (NORVASC®):**

Amlodipine is a calcium-channel blocker, and is a medication used for control of high blood pressure. The dose must be adjusted for each individual and requires reevaluation of blood pressure at 12-24 hours post-pill every 1-2 weeks until the correct dose of drug is established. Monitoring of blood pressure is advised every 3 months thereafter. Rarely, side effects may include gastrointestinal upset or hypotension (weakness and inappetence may be symptoms).

**Hydralazine (APRESOLINE®):**

Hydralazine is a direct arterial vasodilator used to lower elevated blood pressure, and is occasionally used in the treatment of congestive heart failure or in patients with severe hypertension (high blood pressure). Careful monitoring of the blood pressure is required in patients taking hydralazine. Side effects include a fast heart rate (tachycardia), gastrointestinal upset (vomiting, diarrhea), weakness, lethargy and collapse. If your pet experiences any of these symptoms, it is best to discontinue this medication and notify your

veterinarian immediately.

**Sildenafil (VIAGRA®, REVATIO®):**

Sildenafil is a phosphodiesterase inhibitor that relaxes the smooth muscles of arteries. It is used in dogs for the treatment of pulmonary hypertension, a disease in which the arteries supplying blood to the lungs become constricted either for unknown reasons or secondary to chronic lung disease, heartworm disease, etc. Side effects are typically secondary to an excessively low blood pressure, and may include lethargy, weakness or collapse. If your pet experiences any of these symptoms, it is best to discontinue the drug and notify your veterinarian immediately.

**INOTROPICS/INODILATORS:**

Inotropic drugs are those that increase the contractile force of the heart muscle. Inodilators are drugs that not only increase the contractile force of the heart, but also relax the peripheral arteries. Some of these drugs are useful only in a hospital setting, and these include dobutamine and dopamine. Some are used in an oral formulation to help treat patients suffering from congestive heart failure. Digoxin and pimobendan are the two most commonly used drugs. Digoxin is a positive inotropic drug and pimobendan is classified as an inodilator.

**Digoxin (LANOXIN®):**

Digoxin increases contraction strength of the heart, which increases the amount of blood pumped out of the heart. Digoxin will also reduce nerve stimulation to the heart that would normally result in an increased heart rate. With less stimulation, the heart rate slows. Digoxin does not prolong life but does reduce symptoms of heart failure. Effective use of the drug must be monitored by a test that measures concentration blood.

When first starting this medication, a blood level must be measured in 1-2 weeks at 8-10 hours post-medication. Thereafter, levels should be monitored every 3-6 months. The toxic and therapeutic concentrations are very similar. High doses of digoxin can lead to adverse effects, including cardiac arrhythmias, loss of appetite, vomiting and diarrhea. If your pet experiences any of these symptoms, stop the drug and contact your veterinarian immediately. Do not combine with Hawthorne berry extract.

**Pimobendan (VETMEDIN®):**

Pimobendan is a phosphodiesterase inhibitor approved for the treatment of congestive heart failure in dogs suffering from chronic mitral valvular disease or dilated cardiomyopathy. This medication is a calcium channel sensitizer. Termed an inodilator, pimobendan combines the effects of increasing heart muscle pump strength and acts as a vasodilator to decrease the workload the heart is pumping against. This drug is intended to be used in complement to the traditional heart failure treatment.

**ANTITHROMBOTICS:**

Antithrombotics are drugs used to decrease a patient's ability to form a clot. Also known as blood thinners, these drugs are most commonly used in cats with severe heart disease at risk for stroke formation. Warfarin (coumadin) is a commonly used antithrombotic in people. Cats have variable response to this drug, and so it is rarely used. Aspirin and clopidogrel are the two most commonly used oral antithrombotics.

**Aspirin:**

Aspirin (ASA or acetylsalicylic acid) is a non-steroidal anti-inflammatory drug (NSAID) occasionally used to help reduce the risk of clot formation in cats with severe heart enlargement or in dogs with heartworm disease. Aspirin inhibits platelet aggregation, which leads to the formation of a clot. Due to their metabolism, cats cannot take aspirin daily, and are usually put on an every 2 – 3 day regimen. Side effects include inappetance, vomiting (especially any coffee ground like material) or discolored (dark, tarry) stool. If any of these occur while your pet is taking aspirin, it is best to discontinue the drug and notify your veterinarian. Do not combine with a steroid (such as prednisone, prednisolone) as serious gastrointestinal ulceration may result.

**Clopidogrel (PLAVIX®):**

Clopidogrel is occasionally used to help reduce the risk of clot formation in cats with severe heart enlargement. Clopidogrel inhibits platelet aggregation, which leads to the formation of a clot. Side effects are typically milder than those seen with aspirin, but may include inappetance, vomiting and some blood cell dyscrasias. If any of these occur while your pet is taking clopidogrel, it is best to discontinue the drug and notify your veterinarian.

**ANTIARRHYTHMICS:**

Antiarrhythmic drugs are used in the treatment of patients suffering from arrhythmias. There are four general classes of antiarrhythmic drugs, however some have crossover class action. Class I antiarrhythmics are sodium-channel blockers, and include procainamide and mexilitine. Class II drugs are beta-blockers, and include atenolol, metoprolol, and carvedilol. Class III drugs are potassium-channel blockers and include sotalol. Class IV drugs are calcium-channel blockers and include diltiazem. Most antiarrhythmics help control the heart rate, and may be prescribed to patients with rapid heart rates (tachycardia). All patients taking antiarrhythmic drugs should be periodically reevaluated by EKG (ECG or electrocardiography). Occasionally, the placement of a Holter or event monitor may be recommended.

**Mexilitine (MEXITIL®):**

**Procainamide (PROCAN®, PRONESTYL®):**

Mexilitine and procainamide belong to the class of drugs known as Class I antiarrhythmics or sodium-channel blockers. These drugs are used to control rhythm disturbances. They alter the electrical conduction of the heart and can block some types of abnormal rhythms such as ventricular tachycardia (VT or "V-tach"). In general, these drugs are very well tolerated with low risk for side effects, which may include gastrointestinal upset and neurologic dysfunction in rare cases. There is a risk for changing the electrical conduction in a manner that is less stable than the current abnormality. For this reason, reevaluation of the ECG or placement of a Holter monitor is often recommended.

**Atenolol (TENORMIN®):**

**Metoprolol (TOPROL®):**

**Carvedilol (COREG®):**

Atenolol, metoprolol and carvedilol are used to control heart rate, lower blood pressure and control rhythm disturbances. These drugs belong to a general class of drugs known as beta-blockers (Class II antiarrhythmics). These drugs block or reduce the effects of beta-receptor stimulation. Reducing the heart rate and strength of heart muscle contraction can be beneficial for cats with the condition called hypertrophic cardiomyopathy, especially when the heart contracts so vigorously it obstructs the path of blood. Carvedilol also has alpha-blocking activity, which helps to cause relaxation of the arteries, helping to reduce high blood pressure. Beta-blockers may cause some animals to become weak due to a slow heart rate or low blood pressure. Rarely, a pet may faint. It can depress heart muscle function and heart rate to the point of reducing cardiac output. If your pet collapses while receiving a beta-blocker, contact a veterinarian immediately. NOTE: Dose adjustment of this medication requires heart rate evaluation at a trough blood level (i.e. heart rate is checked just prior to the next dose at the prescribed time interval). The goal is to block the ability to generate a heart rate greater than 160 bpm even under stressful conditions. Generally, if patients have been taking beta-blockers for a long time (i.e. longer than 3-4 weeks), abrupt discontinuation is not advised, and tapering is recommended due to the risk of rebound tachycardias (elevated heart rates).

**Sotalol (BETAPACE®):**

Sotalol is used to control heart rate, lower blood pressure and control rhythm disturbances. Sotalol belongs to a general class of drugs known as beta-blocking drugs (Class II antiarrhythmics). These drugs block or reduce the effects of beta-receptor stimulation. Sotalol is also a potassium-channel blocker (Class III antiarrhythmic), reducing the ability of the heart to initiate arrhythmias, and is often used to treat ventricular tachycardia (VT or "V-tach"). Sotalol may cause some animals to become weak due to a slow heart rate or lower blood pressure. Rarely, a pet may faint. It can depress heart muscle function and heart rate to the point of reducing cardiac output. If your pet collapses while receiving sotalol, contact a veterinarian immediately. NOTE: Dose adjustment of this medication requires heart rate evaluation at a trough blood level (i.e. heart rate is checked just prior to the next dose at the prescribed time interval). The goal is to block the ability to generate a heart rate greater than 160 bpm even under stressful conditions. There is a risk for changing the electrical conduction in a manner that is less stable than the current abnormality. For this reason, reevaluation of the ECG or placement of a Holter monitor is often recommended.

**Diltiazem HCl (CARDIZEM®, DILACOR®):**

Diltiazem belongs to a general class of drugs known as calcium channel blockers (Class IV antiarrhythmics). The primary use of diltiazem is for treatment (and sometimes prevention) of cardiac arrhythmias, including atrial fibrillation, atrial flutter and supraventricular tachycardia. Side effects include vomiting, diarrhea, loss of appetite, and a slow heart rate. Any problems should be reported to your veterinarian. Diltiazem may relax blood vessels or depress the heart contraction or rate to such a degree that some animals become weak due to low blood pressure. It must be given with care to animals with heart failure. High doses can decrease heart muscle pump function.

**ANTITUSSIVES:**

Antitussive medications help control coughing. These drugs typically contain an opioid, and as such, they are often controlled substances. Some over-the-counter formulations are available, and typically include the drug dextromethorphan. The most commonly used prescription antitussives are hydrocodone and butorphanol. Side effects may include sedation and constipation.

**Hydrocodone (HYCODAN®, TUSSIGON®):**

**Butorphanol (TORBUTROL®):**

Certain respiratory conditions in dogs are associated with severe or chronic coughing. These include tracheobronchitis (kennel cough), chronic bronchitis, tracheal collapse and bronchial compression. In many instances, the only effective therapy for these major airway irritations is a cough suppressant or antitussive drug. These drugs suppress the cough reflex within the brain and also can cause sedation. They should not be used in the setting of an active bacterial infection of the lungs since a cough is an essential reflex to rid the lung of infection. Cough suppressants should be avoided in animals with significant heart or lung disease, unless supervised by a veterinarian. The most common adverse effects include sedation and constipation. These are controlled drugs and are available only from a veterinarian with an active DEA license. Hycodan® or Tussigon® contains hydrocodone bitartrate 5mg and homatropine MBr 1.5 mg per tablet (or per 5 ml). It is important that this drug is **NOT** confused with **hydrocodone/APAP** (VICODIN®), which contains 5 mg of hydrocodone *and* 500 mg of acetaminophen, which may be potentially toxic to dogs. If you are concerned you may have the incorrect medication, DISCONTINUE it and notify us immediately.

**SUPPLEMENTS:**

The following supplements may be recommended for adjunctive therapy in patients suffering from congestive heart failure. Certain nutritional deficiencies have been associated with heart disease, and supplementation may improve cardiovascular function in certain situations. The following substances are not classified as drugs (pharmaceuticals) and may be known as *nutraceuticals*. Many supplements have NOT been extensively studied, especially in veterinary patients. The following have NOT been evaluated by the Food and Drug Administration (FDA), which normally requires extensive testing and research to establish the safety and efficacy of a given drug. Therefore, patients taking the following supplements do so at their own risk. Fortunately, despite the lack of documented efficacy of many nutritional supplements, side effects are generally minimal. *They probably won't hurt, and just may help.* Due to lack of FDA regulation, supplement and herbal preparations are NOT subjected to quality control testing to ensure the concentration and uniformity of the product. The possibility of a drug interaction also increases with the number of drugs a patient is taking, and most dogs and cats are placed on multiple drugs for the treatment of congestive heart failure. Keep this in mind.

Congestive heart failure can be associated with a number of electrolyte (blood salt) imbalances, and many common veterinary medications may worsen the symptoms of heart failure. Supplementation with potassium, magnesium and Vitamin B1 may be helpful in patients on high doses of furosemide (LASIX®), however potassium supplementation should be instituted only with careful monitoring of blood levels as other cardiac medications may predispose to *elevated* blood levels of potassium. Vitamin E supplementation may increase the risk of congestive heart failure, and vitamin C supplementation may worsen muscle function in humans suffering from congestive heart failure. Generally, non-steroidal anti-inflammatory drugs (NSAIDS) such as carprofen (RIMADYL®), etodolac (ETOGESIC®), and meloxicam (METACAM®), and corticosteroids such as prednisone, methylprednisolone (DEPO-MEDROL®) should be avoided in patients with heart failure.

Congestive heart failure is a very serious and potentially life-threatening condition. The following supplements are therefore not intended to be used in place of, but rather in addition to conventional drug therapy.

**Taurine:**

Taurine (2-aminoethanesulfonic acid) is an amino acid normally found in high concentrations in tissues including the heart and retina, and is used in the liver for detoxification and excretion through the bile. Though taurine is **not** an *essential* amino acid in the dog, severe dietary restriction in certain situations may predispose dogs to deficiency. Cats are predisposed to taurine deficiency if dietary taurine is restricted because taurine **is** an *essential* amino acid in cats, and they have a limited natural ability to make taurine. A completely carnivorous (all-meat) diet supplies abundant taurine to dogs and cats. Diets that are all-cereal and grain-based (**vegetarian** or **vegan**) predispose to **taurine deficiency**. Retinal degeneration, infertility and dilated cardiomyopathy have been associated with taurine deficiency. While incompletely understood, taurine may act in the heart to promote cellular osmoregulation, calcium modulation, free radical inactivation (**antioxidant** properties), as well as other functions. A plasma taurine level (a blood test) is required to

document taurine deficiency in dogs and cats. If we suspect a taurine-deficiency to be implicated in your pet's heart disease, we may recommend testing and supplementation (often along with L-carnitine and coenzyme Q10). Side effects are generally unheard of. Taurine may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

#### **L-Carnitine:**

L-carnitine is a quaternary amine normally found in high concentrations in heart and muscle tissue. Free carnitine is required within heart muscle for fatty acid metabolism and it also has a detoxifying ("scavenging") role in certain elements within individual cells. A completely carnivorous (all-meat) diet supplies abundant L-carnitine to dogs and cats. Diets that are all-cereal and grain-based (**vegetarian** or **vegan**) predispose to **L-carnitine deficiency**. Deficiency of L-carnitine may be caused by a number of factors, including decreased synthesis or dietary intake, intestinal malabsorption, and increased loss through the kidneys, among others. L-carnitine deficiency has been associated with dilated cardiomyopathy in certain breeds, and may be prescribed along with taurine and Coenzyme Q10 for patients suffering from this disease. Side effects are few, and are mainly limited to gastrointestinal symptoms such as nausea, vomiting, and diarrhea. L-carnitine may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®. It is important that only the L-isomer is given, as racemic (mixed) preparations contain inactive D-isomers, so look for "L-carnitine," (**L-acetyl-carnitine** or **L-propionyl-carnitine**) not just "carnitine" or "D/L-carnitine."

#### **Coenzyme Q10:**

Coenzyme Q10 (CoQ10, ubiquinone, ubiquinol) is essential for heart muscle energy production, acting as an **antioxidant**. When supplemented with coenzyme Q10, people receiving conventional therapy for dilated cardiomyopathy may experience increases in contractility. Coenzyme Q10 may be used as an adjunct to traditional therapy to your pet's regimen (often along with L-carnitine and taurine) if they are suffering from congestive heart failure secondary to dilated cardiomyopathy or advanced mitral valvular disease. Side-effects are generally unheard of. Coenzyme Q10 may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

#### **Benzopyrone (RUTIN®):**

Rutin® has been used for years in humans for the treatment of a condition called lymphedema. Animals suffering from a condition called chylothorax (fatty or chylous fluid accumulation within the chest cavity that can impair a patient's ability to expand the lungs normally to breathe) may be prescribed Rutin® to possibly decrease the build-up of fluid. While no definitive studies have proven a benefit, some patients may respond after 2-3 months of supplementation, and side effects are negligible. While low-fat diets may make it easier for a patient to resorb fluid, do not expect a low-fat diet alone to cure chylothorax. Rutin® may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

#### **D-ribose:**

D-ribose is a carbohydrate (sugar) that is important for the body's cellular metabolism through the production of a substance known as ATP (adenosine triphosphate). Patients suffering from severe heart disease, especially heart diseases such as dilated cardiomyopathy, may have severely depleted stores of ATP within heart muscle tissue. A small study in humans with congestive heart failure suggested that supplementation with ribose may improve heart muscle function. Reported minor side effects included diarrhea, gastrointestinal upset and nausea. D-ribose may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

#### **Omega-3 fatty acids:**

Omega-3 fatty acids are naturally found in high quantities in fish oils and other seafoods. They may have antihypertensive and other vasoactive properties that may help certain patients suffering from heart disease. Heart failure is typically associated with a tendency toward elevated blood pressure, which ultimately increases the workload on the failing heart. Specific guidelines have been proposed for the supplementation of omega-3 fatty acid components, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid). Side-effects are generally unheard of. Omega-three fatty acids may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

#### **Pycnogenol:**

Pycnogenol is an extract from the bark of a French marine pine (*Pinus pinaster* ssp. *atlantica*) and contains proanthocyanidins along with several other bioflavonoids (grape seed extracts), found in such things as red wine, grapes, cocoa, cranberries, and apples. It has been touted as a beneficial supplement to help treat a

number of cardiovascular disorders, including hypertension (high blood pressure), **antioxidant**, and procoagulability (increased tendency toward blood clotting), and has been used for its angiotensin-converting enzyme inhibitory effect (ACE-inhibitor activity) in the treatment of human mitral valve prolapse syndrome (similar to canine mitral valve disease). No veterinary-specific data has been obtained for its use in dogs and cats for the treatment of congestive heart failure. Side-effects are typically minimal, and are reported to include minor stomach irritation (administer with meals). Blood sugar levels should be monitored on patients taking pycnogenol, and its administration may be associated with an increased risk of bleeding (and should be avoided in patients taking aspirin, clopidogrel, or warfarin/coumadin). Patients taking ACE-inhibitors (enalapril, benazapril, etc.) should be monitored for weakness and lethargy, as these may be signs of an excessively low blood pressure. Pycnogenol may be found at most supplement sections in pharmacies, Publix®, Whole Foods® or other places like the General Nutrition Center®.

**Hawthorn:**

Hawthorn (Hawthorn berry extract, *Crataegus*) has been shown to be helpful as an adjunct for the treatment of mild to moderate congestive heart failure in people. People with *advanced* congestive heart failure (the majority of veterinary patients diagnosed with congestive heart failure) and in those with systolic failure (heart muscle pump failure, as in patients with dilated cardiomyopathy) failed to demonstrate beneficial effects. While Hawthorn may improve the heart's pumping ability, it is known to interact with the drug digoxin. Digoxin (*LANOXIN*®) is commonly prescribed for the treatment of congestive heart failure in dogs and cats. **ANY PATIENT TAKING DIGOXIN SHOULD NOT RECEIVE HAWTHORN.** Hawthorn increases blood levels of digoxin and predisposes to digoxin toxicity. No veterinary-specific data has been obtained for its use in dogs and cats for the treatment of congestive heart failure. Hawthorn is therefore generally NOT recommended by us for the treatment of dogs and cats for congestive heart failure.

Some evidence exists that suggests **arginine**, an amino acid precursor of a vasoactive substance known as nitric oxide (a vasodilator that relaxes blood vessels, lowering the blood pressure) may be helpful in humans suffering from congestive heart failure in association with coronary artery disease (fortunately very rare in dogs and cats). **Arjun** is an extract of the bark of *Terminalia arjuna*, and has been reported to improve the heart function and lung congestion in patients suffering from severe congestive heart failure. An herb known as **berberine** (Goldenseal, Oregon grape) may increase exercise capacity and heart function while decreasing arrhythmia formation in people with congestive heart failure. **Coleus** (forskolin) may help dilate the blood vessels lowering blood pressure and increasing the force of the heart's contraction. **Creatine** may also increase heart muscle pump function, however *Coleus* and creatine have only been shown to do so when given as intravenous preparations. No veterinary-specific data has been obtained for the use of these supplements and herbs in dogs and cats for the treatment of congestive heart failure.