# Treatment of Canine Congestive Heart Failure

## Torn between multiple lovers

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# **Canine Congestive Heart Failure:** A Multimodal Approach

| Criteria | Treatment Plan | |
|---|---|---|
| **Patient without clinical signs**<br>• Heart disease present (murmur, arrhythmia, enlargement of cardiac chambers).<br>• No signs of congestive heart failure (CHF).<br>• No clear signs of compensation (no volume or pressure overload, hypertrophy of cardiac chambers). | **Correct diagnosis**<br>**Educate owner to watch out for possible signs of CHF** | |
| | **DCM** | **DMVD** |
| | No treatment | No treatment |
| **Patient with clinical signs**<br>• Heart disease present (murmur, arrhythmia, enlargement of cardiac chambers).<br>• No signs of CHF.<br>• Signs of compensation on radiography or echocardiography (volume or pressure overload, hypertrophy of cardiac chambers). | **DCM** | **DMVD** |
| | ACEi ???[1] | ACEi ???[1]<br>(Only in case of severe atrial dilation, and/or pulmonary venous congestion, signs of imminent congestive heart failure) |
| | Control arrhythmia | |
| **CONGESTIVE HEART FAILURE CONFIRMED BY RADIOGRAPHY** | | |
| **Mild/moderate congestive heart failure**<br>• Clinical signs of HF evident during rest or mild exercise.<br>• Poor exercise tolerance, coughing, tachypnoea, mild dyspnoea, mild/moderate ascites.<br>• At rest no signs of systolic dysfunction. | **DCM** | **DMVD** |
| | **Diuretics titrated to the minimum effective dosage** | |
| | ACEi + Pimobendan<br>Omega 3 free fatty acids (FFA) | ACEi +<br>Pimobendan if<br>• systolic dysfunction and/or<br>• large regurgitation fraction and/or<br>• pulmonary hypertension |
| | Control arrhythmia | |
| **Advanced chronic congestive heart failure / home treatment possible**<br>• Obvious clinical signs of congestive heart failure.<br>• Poor exercise tolerance, dyspnoea, marked ascites, hypoperfusion. | **DCM** | **DMVD** |
| | Diuretics + ACEi + Pimobendan<br>Digoxine<br>Omega 3 FFA | Diuretics + ACEi + Pimobendan<br>Additional vasodilators<br>Omega 3 FFA |
| | **Control arrhythmia** | |
| **Acute life-threatening congestive heart failure / Hospitalisation mandatory**<br>• Obvious clinical signs of congestive heart failure (pulmonary edema, ascites).<br>• Poor exercise tolerance, dyspnoea, marked ascites, hypoperfusion.<br>• Patient dying or in cardiogenic shock. | **DCM** | **DMVD** |
| | Furosemide IV<br>O2<br>Absolute rest (cage)<br>Nitroglycerin percutaneously<br>Dobutamine CRI<br>Pimobendan<br>Control arrhythmia | Furosemide IV<br>O2<br>Absolute rest (cage)<br>Nitroglycerin percutaneously<br>Arteriodilators if refractory<br>(hydralazine, nitroprusside) |
| | **ONCE STABLE SEE TREATMENT OF CHRONIC CONGESTIVE HEART FAILURE** | |

[1] At time of writing, there is limited scientific evidence to support the use of ACEi at this stage. Fortekor® is not registered for use at this stage.
Note: This chart should be used as a guide only. A specific treatment plan should be tailored to each individual patient.

# Treatment of Canine Congestive Heart Failure

## Introduction

Heart failure has always been defined as a state wherein the cardiac output is inadequate to meet the perfusion needs of the metabolising tissues. However, it has become apparent that heart failure can no longer be named in simple haemodynamical terms and that the disease should be viewed as a progressive model of over-expression of biologically active molecules exerting toxic effects on the heart and circulation. It is now well established that the heart is more than a pump and that it is also a neuro-endocrine organ. Hence a good understanding of the underlying pathophysiology is required to enable a sensible approach to the treatment of heart failure.

**"...heart failure can no longer be named in simple haemodynamical terms..."**

## Arterial underfilling initiates a cascade

Arterial under-filling (decreased cardiac output and blood pressure) initiates a very complex neuro-humoral cascade, particularly the activation of the sympathetic nervous system (noradrenaline), the attenuation of vasodilator (Nitrous Oxide, prostaglandins and prostacyclins) and natriuretic systems (Atrial Natriuretic Protein/Brain Natriuretic Protein), the activation of the renin-angiotensin-aldosterone system (RAAS), the autocrine vasoconstrictory actions of endotheline (ET), the non-osmotic release of Anti-Diuretic Hormone (ADH), the increased activity of the hypertrophy/fibrosis signaling pathway (remodelling, RAAS), and the liberation of inflammatory mediators (TNF-alpha and interleukins).

When these compensatory mechanisms become overwhelmed clinical signs of heart failure become evident. Additionally, these neuro-humoral reflexes may in the long term have deleterious effects on the heart muscle and circulation.

## Treatment consists of polypharmacotherapy

Considering the complexity of heart failure's pathophysiology it is understandable that its treatment warrants a staged polypharmacotherapeutical approach and that there isn't, and there will never be, a miracle drug counteracting all the harmful effects of this neuro-humoral cascade.

However, heart failure remains a clinical syndrome triggered by a specific cardiac disease (for example degenerative mitral valve disease, dilated cardiomyopathy, intra or extra cardiac shunt,...). Hence every effort should be made to define the underlying aetiology in view of offering the most appropriate treatment on the basis of an accurate diagnosis.

Some treatments show rapid haemodynamical benefits, e.g. frusemide, nitrates, Phosphodiesterase (PDE) III inhibitors, and others are more long-term modulators, e.g. Angiotensin Converting Enzyme Inhibitors (ACEi), betablockers and spironolactone. Many of the drugs providing acute symptomatic relief in heart failure do not lead to long-term benefits and may even lead to untoward long-term clinical outcomes. Therefore veterinarians should not formulate their treatment solely on the basis of haemodynamic improvement but should always incorporate antagonism of the neurohumoral cascade in their long-term treatment strategy.

The jury is still out on the ideal combination therapy, but multiple decades of research and clinical trials in human (CONSENSUS 1987, SAVE 1992, SOLVD 1992, V-HeFT 1993, ATLAS 1999, HOPE 2002, EUROPA 2003) and veterinary medicine (IMPROVE 1995, COVE 1995, LIVE 1998, BENCH 1999) have undoubtedly highlighted the importance of the RAAS in the clinical syndrome of heart failure. Therefore the use of ACEi should remain the mainstay treatment for every animal in heart failure whatever the underlying reason. In this era of evidence based medicine there is ample evidence, with multiple placebo controlled studies enrolling many patients, for the benefits in survival and quality of life in dogs treated with ACEi (IMPROVE 1995, COVE 1995, LIVE 1998, BENCH 1999).

In the more recent years the inodilator pimobendan (Smith 2005, Lombard 2006, QUEST 2008) has also been proven to be very promising in the treatment of congestive heart failure secondary to degenerative mitral valve disease. Its efficacy in decompensated dilated cardiomyopathy in combination with ACEI, diuretics and digoxin was already previously established (Fuentes 2002) and later confirmed (O'Grady 2008).

The question should not be about which drug to use, but about when to use it. A table has been added to give some guidelines in the staged approach of treatment of chronic congestive heart failure in the two most common causes of canine CHF, degenerative mitral valve disease and idiopathic dilated cardiomyopathy. It should be emphasised that the efficacy of drugs used to treat heart failure depends very much on the drug type, underlying disease and individual patient response. There are no set rules and it is important to regularly monitor a patient with heart failure (thorough clinical examination, blood pressure, ECG, radiographs, echocardiography, electrolytes and renal function). Treatment should be adapted depending on the clinical evaluation of the patient.

**"...veterinarians should not formulate their treatment solely on the basis of haemodynamic improvement..."**

## Why keep it simple?

Trying to keep the treatment of heart failure simple by using monotherapy reflects poor understanding of heart failure's pathophysiology. The clinical syndrome of heart failure represents multiple anatomical, functional, biological and genetic alterations that interact together. It is this complex interaction that makes heart failure treatment an intellectual challenge tailored to the individual patient. Good clinicians will distinguish themselves by using a combined approach. Trying to simplify the treatment just might not be in the animal's interest. In human medicine, where polypharmacotherapy is standard, multiple trials have shown that repetitive monitoring by experienced individuals improved quality and duration of life. There is no reason to think that this should be different in veterinary medicine.

**Trying to simplify the treatment just might not be in the animal's interest.**

## Why choose?

Currently there is a lot of debate about the use of pimobendan instead of an ACEi in heart failure patients and one of the most commonly asked questions at current cardiology seminars is 'which one to use'. My answer is that it is like asking a child to choose between his father and his mother. Both are essential, but perhaps one might be more important/useful than the other at different timings. Why choose if we can benefit from both? Once again, the question is not what to use, but when to use it.

I do realise that the evaluation of efficacy of polypharmacotherapy by a clinical trial is very complex and warrants high numbers of enrolled patients, and might be something unfeasible in veterinary medicine. However multiple retrospective studies conducted in cardiology referral centers in the USA and Europe and using staged multimodal therapy (Ettinger 2008, Van Israël 2009) have shown far better survival results than head to head trials (Lombard 2006, QUEST 2008).Therefore, as a clinician, I can only emphasise that we treat clinical patients with individual needs and responses.

## Conclusion

Life might be full of choices but heart failure treatment shouldn't. Therapy should be tapered to the needs of the individual patient based on an accurate diagnosis. A staged polypharmacotherapeutical approach is the ideal way forward. It accentuates the understanding of heart failure's pathophysiology.

The application of this knowledge distinguishes the good veterinary clinician from the sales person. And last but not least, the animal will benefit from it.

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