WHAT IS NEW IN CARDIOLOGY?

John E. Rush, DVM, MS, DACVECC, DACVIM (Cardiology)
Tufts University Cummings School of Veterinary Medicine

A strong knowledge of cardiovascular physiology and cardiovascular pathophysiology is useful for management of cardiovascular diseases in small animals. This session will review a few key cardiovascular physiology concepts and summarize some of the newer developments in veterinary cardiovascular medicine.

Pimobendan – Pimobendan is a calcium sensitizing drug that is useful as a positive inotrope in addition to having properties as a phosphodiesterase inhibitor with vasodilating effects. It has been studied in dogs with chronic valvular disease and in dogs with dilated cardiomyopathy. In dogs with dilated cardiomyopathy most studies indicate that there is a notable clinical benefit to addition of pimobendan to background therapies for heart failure. In most veterinary studies, pimobendan treated dogs have fared as well or better than dogs treated with ACE inhibitors. Pimobendan also seems to be associated with a low side effect profile, and any side effects do not appear to be associated with any negative impact on the animal’s well being. The drug has only been studied in animals with active CHF, and the role for this drug in pre-CHF situations is unclear. Some studies have raised concerns about use of pimobendan before the onset of CHF – currently the author is withholding pimobendan until CHF is present or at least some signs of significant cardiac disease (eg, cough with moderate to marked left atrial enlargement) are evident. The usual dose for pimobendan is 0.25 mg/kg q 12 hours. The safety and efficacy of pimobendan use in cats is less well studied.

Natriuretic Peptides – The natriuretic peptides are a family of structurally similar genetically distinct proteins including atrial natriuretic peptides (ANP), brain natriuretic peptides (BNP), C-type natriuretic peptide (CNP), and urodilatin. These proteins are regulators of salt and water homeostasis and blood pressure. Atrial natriuretic peptide (ANP) is chiefly produced in the atria but expression by ventricular myocardium is increased in disease states. ANP is synthesized as pro-BNP which undergoes cleavage of a signal peptide yielding pro-ANP. ProANP is stored in atrial myocyte granules; it is cleaved into inactive NT-proANP and active C-terminal ANP which are released into blood in response to atrial stretch and dilation. Canine and human ANP are very similar in structure. B-type natriuretic peptide (BNP; also called Brain Natriuretic Peptide) is also produced in the atria with limited synthesis in ventricular myocardium under normal circumstances. However, chronic pressure or volume overload states lead to increased ventricular synthesis and ventricular myocytes become the major source of BNP. The single precursor molecule pro-BNP processed into active BNP and biologically inactive NT-proBNP. NT-proBNP is characterized by higher serum concentrations and a longer half-life than BNP and appears to be the more clinically useful biomarker. Unlike ANP, there is much variability in inter-species length, structure and action of BNP and species-specific analyzers are needed. Natriuretic peptides are released in response to atrial stretch and dilation that accompany congestion or increased ventricular wall stress as may accompany cardiomyopathies. These proteins exert actions of natriuresis, diuresis, and balanced vasodilatation. Natriuretic peptides counteract RAAS and sympathetic nervous system, inhibit vasopressin release, and modulate cardiomyocyte hypertrophy and fibrosis. As BNP synthesis is controlled at the level of transcription, a longer term stimulus is required for release and BNP is less susceptible to rapid fluctuations in hemodynamic status. Production is increased in response to wall stretch and wall tension and may be increased in the face of ventricular dysfunction and hypertrophy even in the absence of elevated filling pressures. Commercial assays for the natriuretic peptides are available but are not yet standardized for all peptides. In particular, BNP assays are highly species-specific and human assays cannot be used for analysis of BNP in veterinary patients. An assay for canine NT-proBNP has recently become commercially available and was officially launched in January of 2008. Normal dogs and cats have very low levels of circulating ANP and BNP. Clinical applications will likely include assessment of congestive heart failure, determination of the presence or degree of underlying heart disease, and differentiation of cardiac from respiratory disease in the emergency setting. They will likely not be useful to differentiate between different types of heart disease. It appears that NT-proBNP has potential to be
useful as a screening tool for feline heart disease, especially to determine the present of clinically significant heart disease.

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