Measurement and Clinical Use of Cardiac Troponin I (cTnI) in Horses

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Cardiac troponin I (cTnI) can be accurately measured in horses within 10 min using whole blood and the i-STAT1. Abnormally high cTnI in the blood seems to be specific for cardiac myocyte injury. cTnI measurement can be useful in many clinical situations including the diagnosis and management of both primary and secondary cardiac diseases. Authors’ address: Department of Clinical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, New York 14853; e-mail: tjd8@cornell.edu. © 2010 AAEP.

1. Introduction
Cardiac troponin I (cTnI) is a sensitive and specific biomarker of myocardial injury in human medicine, and it is used to diagnose and provide prognostic information in patients with both primary and secondary cardiac disease. A point-of-care analyzer i-STAT1 is available that can measure cTnI in plasma, serum, or heparinized whole blood within 10 min.

2. Materials and Methods
Several studies to determine clinical uses of cTnI were performed in horses. First, 83 normal horses were used to validate reference values of cTnI using the i-STAT1. Six horses were administered monensin, at doses less than the reported LD 50, to evaluate cTnI during monensi-induced cardiac disease. Twenty-four horses (11 healthy, 9 with unexplained poor racing performance, and 4 with chronic intermittent rhabdomyolysis [CIR]) were tested after treadmill exercise to help determine both specificity of the cTnI assay and if cTnI is increased in normal or poor-performing racehorses after near maximal short-term exercise. Equine cTnI was administered intravenously to two ponies to determine half-life of the protein. Plasma cTnI was evaluated as a prognostic indicator of survival during the perioperative period in 31 horses undergoing abdominal surgery. cTnI was also measured in selected hospitalized horses with primary cardiac diseases (myocarditis, pericarditis, and endocarditis), horses with acute severe hypoxia, and in one naturally occurring outbreak of monensin poisoning to further evaluate the diagnostic and prognostic value of cTnI measurement in those clinical conditions.

The study protocols and care of the horses were approved by the Cornell University College of Veterinary Medicine Institutional Animal Care and Use Committee.
3. Results and Discussion

Normal cTnI values for adult horses using the i-STAT1 are 0.00–0.06 ng/ml. cTnI measurement can identify horses with cardiac disease after acute monensin exposure, and marked or prolonged elevations indicate a poor prognosis. cTnI concentrations were normal in horses with CIR after treadmill exercise in spite of marked elevations in creatine kinase, which helps support the idea that increases in blood cTnI are specific for myocardial injury. The half-life of equine troponin is very short, and testing horses 1–2 h after exercise may be appropriate for investigating myocardial injury as a cause for otherwise unexplained poor performance in horses. Horses with colic requiring abdominal surgery may have increased cTnI either before or after surgery, and cTnI may be a useful biomarker for prognosis.

Horses with myocarditis have high levels of cTnI, and measurement is important in both the diagnosis and management. Horses with ventricular arrhythmias and other primary cardiac diseases may have normal or abnormal cTnI levels, but measuring cTnI might be helpful in the clinical management of those cases, helping to determine need for corticosteroid treatment or period of rest. Horses with acute severe hypoxia or systemic inflammation may have marked elevations in cTnI, often corresponding to severity of the illness. Changes in cTnI after treatment are more important in most critically ill horses than the level at hospital admission.

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