Assay of cardiac troponins in the diagnosis of myocardial degeneration due to foot-and-mouth disease in a calf

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TROPONIN, a globular protein localising on the thin filament of all striated muscles, plays a role in the contraction and relaxation of striated muscles. Cardiac troponins consist of three subunits: cardiac troponin-T (cTn-T), cardiac troponin-I (cTn-I) and troponin-C (cTn-C) (Cardinet 1997, Müller-Bardorff and others 1997, Müller-Bardorff and others 1997, Ricci 1999). The diagnostic and prognostic importance of troponins has been determined in human beings with myocardial infarction (MI). Since they are released during microinjuries to the heart muscle, cTn-I and cTn-T have been determined to be better cardiac markers in MI than other markers such as creatine kinase-MB (CK-MB), aspartate aminotransferase (AST), lactate dehydrogenase (LDH) and myoglobin (Müller-Bardorff and others 1997, Azzazy and Christenson 2002).

cTn-T is an excellent candidate biomarker of cardiac injury in all mammalian species. O’Brien and others (1997) demonstrated that the reactivity of cTn-I is higher for myocardium than for skeletal muscle, and there is a marked sequence homology between human and the bovine cTn-I. cTn-T is another cardiac structural protein released into the circulation during myocardial injury, and although it is a valuable cardiac marker, it is no more sensitive than CK-MB for acute MI in human beings (Jurlander and others 2000, Koukkunen and others 2001); it is also released during skeletal muscle and renal damage (Mockel and others 1999).

Myocarditis in domestic animals may result in sudden death. In young calves, one cause of sudden death is foot-and-mouth disease (FMD), a contagious disease of ruminants with high morbidity. Although the mortality rate is considerably lower in adult cattle, in calves it may be up to 50 per cent; young calves may die before showing any observable lesions due to virus-induced damage to the developing cells of the myocardium (Van Vleet and Ferrans 1986, Barnett and Cox 1999).

Myocarditis in farm animals could be slaughtered before sudden death. Therefore cardiac markers such as troponins could be used to diagnose myocarditis in animals.

Although no attempts were made to isolate virus, the case history and pathological findings were consistent with previous reports and suggestive of FMD (Van Vleet and Ferrans 2001). Clinical trials have indicated that serum cardiac troponins are the first biochemical markers to appear during the course of acute coronary disease in human beings (Bocca and others 2000, Charles and others 2000, Fredericks and others 2001). Clinical trials have indicated that serum cardiac troponins are the first biochemical markers to appear during the course of acute coronary disease in human beings (Bocca and others 2000, Ooi and others 2000). The diagnosis of myocarditis in farm animals due to, for example, hereditary factors, vitamin E and selenium deficiency, microorganisms, traumatic injuries or heart parasites (Van Vleet and Ferrans 1986), is important because in such cases the animals could be slaughtered before sudden death. Therefore, it is important to identify early the presence of myocarditis.

Blood tests for the diagnosis of cardiac injury in animals are inadequate. Although troponin complex proteins have been determined in animals, there are a limited number of studies on their clinical use. Studies in animals have mainly included laboratory animals and have been designed for the detection of MI in human beings (McAuliffe and Robbins 1991, Ricchiuti and others 1998, Charles and others 2000, Fredericks and others 2001). Clinical trials have indicated that serum cardiac troponins are the first biochemical markers to appear during the course of acute coronary disease in human beings (Bocca and others 2000, Ooi and others 2000). The diagnosis of myocarditis in farm animals due to, for example, hereditary factors, vitamin E and selenium deficiency, microorganisms, traumatic injuries or heart parasites (Van Vleet and Ferrans 1986), is important because in such cases the animals could be slaughtered before sudden death. Therefore cardiac markers such as troponins could be used to diagnose myocarditis in animals.

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1986) as the disease was endemic in the region (Erdogan and others 2004).

Analysis of the calf’s serum revealed considerable increases in AST and LDH, which might indicate myocardial degeneration. Although the concentration of AST increases during cellular degeneration of striated muscle and liver, increases in LDH together with AST are indicative of myocarditis (Cardinet 1997). The positive results of the cardiac troponin tests supported the results of serum enzyme analyses and pathology.

The present findings suggest that cardiac troponin tests produced for use in human beings could also be used in cattle, as the antigenic similarity of human and bovine cTn-I is 96·4 per cent (O’Brien and others 1997). The use of tests for cardiac troponins may enable veterinarians to diagnose myocardial degeneration due to FMD in cattle herds, which may lead to early intervention. Cardiac troponins are important markers for myocardial injury because they are released into the blood soon after any microinjury occurs in the myocardium and can therefore be used for the diagnosis and prognosis of cattle suffering from cardiac problems. The clinical use of the markers should be investigated in detail in the field.

References