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Biochemical and enzymatic changes in downer cow syndrome

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Downer cow syndrome is a complication of recumbency associated with milk fever (Radostits *et al.* 2007). Downer syndrome is characterized by inability of an animal to stand from recumbency voluntarily. Occurrence of this syndrome, has been reported in cows (Wadhwa and Prasad, 2002). The present paper describes biochemical and enzymatic changes in clinical cases of downer syndrome in cows.

Sixteen cows of 4–8 years of age with history of inability to rise voluntarily for the varied period of time, were brought to the veterinary hospital, Panna Lal Goshala, Jodhpur, between March 2007 to February 2008. Twelve cows were post parturient and four cows were in advance pregnancy. Clinical manifestations were recorded. Six healthy cows were included to serve as control. About ten millilitre of blood was collected from each downer cow and healthy cows and serum was separated and stored at –20°C.

The concentration of calcium, phosphorus, magnesium, sodium, potassium, total protein AST, ALT and CPK were measured in serum using kits. Data were analysed statistically as per Snedecor and Cochran (1994).

Clinically the downer cows appeared bright and alert but off-feed. The body temperature was within normal range. Animals tried to stand-up repeatedly but could not rise to their feet. They could raise their fore quarters, but failed to put up weight on hind quarters. The mean ± SE value of minerals, electrolytes, enzymes and total proteins are given in Table 1.

The values of calcium, phosphorus, potassium were significantly low ($P< 0.05$) in downer cows incomparison to healthy control cows (Table 1). Low plasma calcium, phosphorus and potassium concentration have been reported by Wadhwa and Prasad (2007). Radostits *et al.* (2007) stated that calcium, phosphorus and magnesium levels of blood remained within normal range in downer cow. However, a persistent hypocalcemia following treatment for milk fever may exist in a downer cow. The exact explanation for low calcium and phosphorus in downer cows in present study is not known. Hypokalaemia has been reported in downer cows by Allen and Davies (1981). The persistent hypocalcemia and hypophosphatemia has been regarded as cause of downer cow syndrome associated with milk fever (Radostits 2007). Hypokalaemia in recumbent cows occurs due to the fact that muscle ischaemia as a result of prolonged recumbency increases the cell membrane permeability of muscle fibres and allow loss of potassium from the cell causing myotonia which appears to be the basis of downer cow syndrome (Andrew *et al.* 1992). The magnesium concentration was slightly high in present study. Hypomagnesemia (Baumgartner and Gattinger 1982, as well as normal magnesium level (Narayana *et al.* 1977) have been) recorded in downer cows. The sodium concentration in downer cows was within normal range. Hypokalemia could also occurs due to rapid urinary excretion and diminished alimentary absorption of potassium associated with reduced feed intake. Diminished excitability of nerve and muscle cells, weakness and flaccid paralysis are the consequences of hypokalaemia (Kowalezyk and Mayer 1972). The values of total protein

Table 1. Mean ± SE value of minerals, electrolytes, enzymes and total protein in downer cows (n = 16) and healthy control cows (n = 6)

Parameter	Downer cows (n = 16)	Control (n = 6)
Ca (mg/dl)	7.62±0.21*	10.90±0.25
Pi (mg/dl)	3.94±0.05*	5.23±0.24
Mg (mg/dl)	3.33±0.11	2.30±0.11
Na (mEq/l)	119.56±2.83	122.17±2.80
K (mEq/l)	1.90±0.05*	4.37±0.20
Total protein (g/dl)	7.13±0.13	7.58±0.52
AST (units/l)	117.88±6.33*	118.00±7.23
ALT (units/l)	84.75±3.42*	54.83±3.67
CPK (units/l)	128.27±2.31*	28.44±0.54

*P≤0.05.

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fluctuated within normal range in downer cows.

The mean values of AST, ALT and CPK in downer cows were significantly high ($P<0.05$) in comparison to healthy control cows (Table 1). Prolonged recumbency causes ischaemic necrosis of muscles (Cox *et al.* 1982) resulting in increased permeability of cell membrane allowing seepage of AST, ALT and CPK enzymes into circulation. Increased levels of AST, ALT and CPK enzymes had been observed in cows by El-Sayed *et al*. (1994) and Wadhwa and Prasad (2007) in buffaloes. Creatine phosphokinase is considered as a specific marker of muscle damage (Kaneko 1989) and increase in CPK testified ischemic damage to the muscle causing its seepage into the circulation. The CPK levels need to be interpreted in relation to the days of recumbency when the sample is taken. Critical levels may be highest initially up to 50 times and may reduce to 10 times normal range at 7 days of recumbency (Radostits 2007).

SUMMARY

The biochemical and enzymatic changes were observed in sixteen downer cows. Significantly low concentration of calcium, phosphorus and potassium and significantly higher activities of serum enzymes of creatinine phosphokinase, aspartate and alanine amino transferase were observed in downer cows. Downer cows should be treated with potassium in addition to calcium and phosphorus.

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