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Short Communication

Plasma mineral profile in relation to pregnancy rate in repeat breeding cows

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ABSTRACT

Thirty eight crossbred cows were taken with the history of repeat breeding condition to study the plasma mineral profile viz. copper (Cu), cobalt (Co), zinc (Zn), magnesium (Mg) and calcium (Ca) in relation to pregnancy rate. The percentage of animals significantly deficient in plasma level of Cu, Co, Zn, Mg and Ca were 34.21%, 21.05%, 44.74%, 42.10% and 26.32%, respectively. All the animals were inseminated in the subsequent estrus and pregnancy rate was confirmed by palpation per-rectum. The pregnancy was significantly lower in the animals deficient in Cu (64.00% in normal cows' vs 7.70% in deficient cows) and Zn (57.00% in normal cows' vs 23.53% in deficient cows). The present study clearly indicates that minerals viz. Cu, Co, Zn, Mg and Ca are essential for optimum fertility; however, deficiency of Cu and Zn plays a significant role in reducing the conception rate.

Key words: Crossbred cow, Plasma mineral, Pregnancy rate

Repeat breeding is one of the major reproductive problems in the dairy cows leading to substantial loss to dairy farming. The incidence of repeat breeding has been reported from 5.5 to 33.3% in cows (Narnboodaripad and Raja, 1972). Among the different factors responsible for repeat breeding condition, mineral deficiency is one of the major causative factors. It is well known that minerals play intermediate role in the action of hormones and enzymes (Dhoble and Gupta, 1986). The deficiency of minerals may affect the hormone and enzyme systems, which ultimately affect the reproductive performance of the cows. The present study was undertaken to investigate the relationship between some of plasma mineral levels and pregnancy rate in crossbred cows.

The present study was conducted on 38 crossbred cows maintained at Instructional Dairy farm of the University with the history of conception failure even after four consecutive inseminations without any apparent abnormality. Per-rectal palpation of genital system also revealed no apparent palpable abnormalities. The animals were maintained under standard housing, feeding and managemental conditions. In the next estrum animals were administered broad spectrum anti infection agents to rule out the possibility of uterine infections and allowed sexual rest. About 5 ml of blood samples were collected form jugular vein of each cow. The plasma samples were separated and collected in sterilized cryovials and stored at -20°C temperature.

The plasma samples were estimated for mineral profile *i.e.* copper (Cu), cobalt (Co), zinc (Zn), magnesium (Mg) and calcium (Ca) using Atomic Absorption Spectrophotometer. Subsequently during next estrum, all the animals were bred artificially with fertile bull semen and pregnancy was confirmed perrectrum at day 60 post-insemination. All the animals were divided in two groups on the basis of values of plasma mineral profile viz. normal and deficient animals. The data was analyzed statistically using two sample't' test for mean and χ^2 test for proportion as per Snedecor and Cochran (1976).

The mean plasma mineral values with standard errors recorded in normal and deficient cows are presented in table 1.

Copper: Copper has significant role in maintaining the optimum fertility as it acts as an indicator for FSH, LH and estrogen activity (Desai *et al.*, 1982). A significant higher level of plasma copper was observed in normal cows than in deficient cows which is in accordance to the findings of Rupde *et al.* (1993) and Das *et*

al. (2002). In contrast to this study Dutta *et al.* (2002) found apparently higher level of serum copper in repeat breeding cows. The pregnancy rate was significantly lower in the deficient cows (7.70%) as compared to normal cows (64.00%). The study suggests that poor fertility with low blood copper concentration can be improved with copper supplementation (Rowlands *et al.*, 1977).

Cobalt: The mean plasma concentration of cobalt in normal cows was significantly higher than in deficient cows. Cobalt as such is not important but it is required for the synthesis of cyanecobalamin. Deficiency may cause a lack of appetite, depraved appetite, inanition, secondary failure of estrum and delayed onset of puberty in cattle (Roberts, 1971).

Zinc: The mean plasma concentrations of zinc and pregnancy rate were significantly higher in normal cows than in deficient cows thus suggesting a relationship between zinc level and fertility. The present finding was in accordance with Rupde *et al.* (1993) and Das *et al.* (2002). Zinc is an essential nutrient, functioning largely on enzyme systems and deficiency seriously impairs reproduction in females (Miller, 1970). Optimum level of zinc is essential to maintain the activity of FSH and LH (Apagar, 1985) and thereby facilitating normal reproduction performance.

Magnesium: A significantly higher concentration of magnesium was observed in blood plasma of normal cows than deficient cows. The higher pregnancy rate was observed in the cows having normal plasma magnesium level as compared to the cows having low magnesium level.

Calcium: The mean plasma concentration of calcium in normal cows was significantly higher in normal than in deficient cows. Higher pregnancy rate was observed in the cows having normal plasma calcium level which is in accordance to the findings of other workers (Ashturkar *et al.*, 1995; Burle *et al.*, 1995; Rupde *et al.*, 1993). Calcium is responsible for sensitizing the tubular genitalia for the action of hormones there by increasing the fertility rate in the animals (Moddie, 1965). Calcium also plays an important role as calcium dependent mechanisms are involved in steroid synthesis in the ovaries and LH release from pituitary (Hurley and Doane, 1989).

It may be concluded from this study that most of the cows were deficient in single mineral or in combination of many minerals leading to poor conception rate. Copper and zinc deficiency plays significant role in reducing the conception rate however, deficiency of cobalt, calcium and magnesium could not be ignored in the repeat breeding cases. Cows with repeat breeding problem without functional deformity of the genital tract or infections can suffer from plasma mineral deficiencies.

Table 1: Mean ± SE values of plasma minerals and pregnancy rates in normal and deficient repeat breeder cows.

Miner	Mean ± SE of plasma mineral (µg/ml)		Percentage of deficient cows	Pregnancy rates	
	Normal cows	Deficient cows		Normal Cows	Deficient Cows
Cu	0.65±0.20(25)	0.22±0.03*(13)	34.21%	64.00 %	7.70%**
Co	2.18±0.18(30)	0.85±0.10**(8)	21.05%	50.00%	25.00%
Zn	1.09±0.11(21)	0.65±0.03**(17)	44.74%	57.00%	23.53%*
Mg	22.57±0.62(22)	9.82±1.12**(16)	42.10%	50.00%	37.50%
Ca	107.47±3.50(28)	69.65±6.49*(10)	26.32%	50.00%	30.00%

Figures in the parenthesis indicate number of animals.
Means bearing different superscript in a row of each parameter differ significantly.
P<0.01; **P<0.05

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