CONCEPTION RATE IN RELATION TO MICRONUTRIENTS STATUS IN EMBRYO RECIPIENT COWS

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ABSTRACT

Minerals play an important role in regulation of reproduction and production of domestic animals. Micro minerals act as cofactors, activators of enzymes or stabilizer of secondary molecular structures. These trace elements also help in maintaining optimum fertility in farm animals and any deficiency of these micronutrients interfere with normal reproduction resulting into reproduction failures. The present study was conducted to evaluate the effect of micronutrients on conception rate in embryo recipient cows. Estimation of Cu, Zn, Fe, Mn and Co were carried out in 36 embryo recipient cows by Atomic Absorption Spectrophotometer. Results indicated that serum level of Cu, Zn, Fe, Mn and Co were significantly higher in pregnant cows than non-pregnant cows on day of embryo transfer, day - 7 and day - 14 post embryo transfer. The study indicated that the micronutrient status of the animals must be assessed before selecting the recipient.

Keywords : Micronutrients, Embryo recipient, Conception rate.

INTRODUCTION

Reproductive biologists of world accept role of minerals in reproduction of animals. Mineral plays an important role in regulation of reproduction and production of domestic animals (Verma *et al.*, 2008, Dutta *et al.*, 2002). Mineral imbalance is frequently associated with infertility. There were low mineral levels in the blood of cows with low fertility noticed by Kroop and Ashmead (1993). The term micro-mineral refers to those specific elements that are present in small amounts in the diet and are needed in small amounts by the body (Segerson *et al.*, 1977; Corah, 1996). Micro-mineral functions as cofactors, activators of the enzymes or stabilizers of the secondary molecular structures (NRC, 2001). Five decades have passed since the birth of first embryo transferred calf. The conception rate in embryo transfer recipient is unpredictable. In India mineral deficiency is one of the most important factors responsible for infertility in dairy animals. The low levels of trace elements affect adversely in embryo donors resulting into not only poor superovulatory response but also poor embryo recovery and poor quality of embryos.(Verma *et al.*, 2008)The deficiency of trace elements may influence the capability of female to conceive and carry the fetus to term. Similarly, low levels of certain micronutrients in embryo recipients may interfere with normal reproductive potential of recipients to accept the embryo and carry the conceptus. Hence the present study was conducted to evaluate the effect of micronutrient status on conception in embryo recipients.

MATERIALS AND METHODS

The study was conducted at Instructional Dairy Farm, Nagla, GBPUA&T, Pantnagar. The animals were selected on the basis of reproductive history, per rectal examination and their production potential. A total of 15 donor animals and 60 recipients (4 recipient per donor) were selected. Donor animals were superovulated by using eight equal divided doses of PSH-P (Follotropin, Bionichae, USA) regime. Superovulatory estrus was

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induced on day 12 of estrous cycle by 5 ml (0.750mg) tiaprost trometamol (Ilirin, Intervet, Germany) by intramuscular route with 5th and 6th FSH injections. All the donor animals were inseminated thrice at superovulatory estrus and on day 7 embryo collection was done. Embryos of excellent and good quality were transferred to synchronized recipients.

Blood samples were collected from the embryo recipients on the day of embryo transfer, day 7 post ET and day 14 post ET. Serum sample was harvested and transferred to the sterilized vial and stored at -20°C till analysis.

For analysis of Copper, Zinc, Iron, Manganese and Cobalt, the serum samples were first digested by nitric acid and triple acid mixture. Digestion was carried out in beaker containing 1 ml serum and 5 ml nitric acid. The test tube was then kept over a hot plate for 30 minutes when sample was reduced to 1 ml. The test tube was allowed to cool, now 5 ml of triple acid mixture, containing nitric acid, perchlor acid and sulphuric acid in ratio 10:4:1 was poured into test tube. The test tube was kept over hot plate and removed when contents were reduced to 1 ml. The digested sample was then cooled and volume was made 10 ml by adding 10 ml triple glass distilled water. The Copper, Zinc, Iron, Manganese and Cobalt levels were determined by Atomic Absorption Spectrometer (GBC Avanta Sigma Scientific equipment Pvt. Ltd Victoria, Australia) using the following settings.

Element	Max Lap Current (mA)	Wavelength (nM)	Slit setting (nM)	Flame type
Copper	5	324.75	0.4	Air-C_2H_2 flame
Zinc	10	213.86	0.4	Air-C_2H_2 flame oxidizing
Iron	7	248.3	0.2	Air-C_2H_2 flame oxidizing
Manganese	5	273.5	0.2	Air-C_2H_2 Stiochiometric
Cobalt	6	240.70	0.2	Air-C_2H_2 flame oxidizing

RESULTS AND DISCUSSION

The level of copper in embryo recipient which conceived ranged from 2.13 ± 0.05 to 2.22 ± 0.32 µg/ml and in non pregnant animals, it was 1.79 ± 0.027 to 1.84 ± 0.027 µg/ml. Serum copper levels were significantly higher ($P < 0.01$) in pregnant animals than non pregnant animals. Level of serum zinc in pregnant animals ranged from 2.81 ± 0.014 to 2.99 ± 0.027 µg/ml and in non-pregnant animals it ranged from 2.21 ± 0.02 to 2.25 ± 0.02 µg/ml. Serum zinc levels were significantly higher ($P < 0.01$) in pregnant animals than non pregnant animals. Level of iron in recipient which conceived ranged from 5.46 ± 0.05 to 5.49 ± 0.65µg/ml and in non-pregnant recipients it was 4.88 + 0.04 to 4.97 ± 0.04 µg/ml Serum iron levels were significantly higher ($P < 0.01$) in pregnant animals than non pregnant animals. The level of manganese in pregnant recipient ranged from 0.65 + 0.03 to 0.69 ± 0.02 µg/ml and in non-pregnant recipient, it ranged from 0.45 + 0.01 to 0.59 ± 0.02 µg/ml. Serum, manganese levels were significantly higher ($P < 0.01$) on day of ET and day 7 post ET and ($P < 0.05$) on day 14 post ET in pregnant animals than non pregnant animals. Level of cobalt in present study in conceived animals ranged between 0.60 ± 0.08 to 0.62 ± 0.078 µg/ml and in non pregnant recipient it ranged between 0.55± 0.01 to 0.5 ± 0.01 µg/ml. Serum cobalt levels were significantly higher ($P < 0.05$) in pregnant animals than non pregnant animals.

Findings of present study lends support to the observations of Singh *et al.*, (1991) who documented increase in whole blood plasma and erythrocytic copper concentrations in pregnant buffaloes. During gestation high demand of copper for developing fetus is fulfilled by conserving copper through increasing absorption and preventing losses by excretion (Gooneratne *et al.*, 1989). Nath *et al.*, (2004) reported significantly high value of copper and zinc in normal breeders than anestrus cows. Prasad and Maurya, (2002) found that embryo recipient cows which conceived had significantly higher ($P<0.05$)-levels of copper in comparison to those that did not conceive. Upadhyay, (2004) also reported significantly higher value ($P<0.01$) of copper, manganese and cobalt in conceived animals than non conceived animals.

Minerals have a basic key role in fertility management in dairy cattle and have specific

requirement in reproductive tissues. Variations in certain blood constituents during different reproductive phases alter the proper functioning of reproductive organs. Micormineral deficiency impairs enzymatic function and metabolism of reproductive functions which produce concomitant reproductive disorder which affects reproductive efficiency.(Dutta *et al.*, 2002)

Lower values of zinc, iron and manganese in repeat breeders have been reported by Dutta *et al.* (2002). Vohra et al. (1995) reported higher value of cobalt in cyclic animals than anestrus animals. Our findings also suggested that the serum levels of copper, cobalt, zinc, iron and manganese were significantly higher ($P<0.01$) in those animals which conceived as compared to non conceived animals as also observed by Prasad and Maurya (2002) indicating that optimum level of these micronutrients has some beneficial effect on conception in embryo recipients and low levels were contributing to failure of conception in recipients.

Hence it may be concluded from the present study that these micronutrients (Fe, Cu, Co, Mn, Zn) are directly related to conception rate in embryo recipients and therefore, due consideration must be given to assess the micronutrient status of the animal while selecting a recipient in an embryo transfer programme.

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