

SERUM AND ESTRUS MUCUS ENZYMES ACTIVITIES AND CHEMISTRY OF NORMAL AND REPEAT BREEDER FRIESIAN CATTLE

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ABSTRACT

Estrus mucus (EM) and blood (serum) was collected from 40 apparently normal cattle (Normal breeder, NB = 20; Repeat breeder, RB = 20) at the time of insemination for glucose, minerals, alkaline phosphatase (ALP), lactic dehydrogenase (LDH) and α -amylase concentration. In NB cattle, serum glucose and magnesium were low ($p < 0.05$), whereas, calcium and zinc were high ($p < 0.05$) compared to their respective values in RB cattle. In NB cattle, serum ALP was highly active ($p < 0.05$) compared with RB cattle, while LDH was highly active ($p < 0.05$) in both serum and EM of RB compared with NB cattle. Serum α -amylase was similar ($p > 0.05$) in NB and RB cattle, while RB cattle EM had lower ($p < 0.05$) α -amylase. The pregnancy rate calculated after four maximum inseminations and following categorization into NB or RB cattle was 80% and 60%, respectively. In brief, the variations in serum and estrus mucus enzyme activities and chemistry could be associated with breeding success in Friesian cattle.

Keywords: Blood serum, Enzyme, Estrus mucus, Fertility, Mineral

INTRODUCTION

The physical and biochemical properties of cervical mucus during estrus play a deterministic role in conception. Many enzymes in estrus mucus are involved in energy mechanisms like degradation of glycogen or joining or disjoining of some anions in the female genital tract during sperm capacitation (Vermeiden *et al.*, 1989). Trace elements may function as cofactors, as activators of some enzymes or stabilizers of secondary molecules structures (Vadodaria and Prabhu, 1990). The aim of present study was to characterize estrus mucus enzymatic and chemical activity in normal and repeat breeder cattle.

MATERIALS AND METHODS

Apparently normal and healthy Friesian cattle (n=40) in standing estrus with clear stinky estrus mucus were randomly selected at the time of insemination. These animals were artificially inseminated using frozen thawed semen and were observed for estrus

during post-insemination period followed by pregnancy diagnosis through rectal palpation about 45 days after the last insemination. The cattle conceiving with less than three inseminations were considered normal breeder (NB, n=20), while others requiring more than three inseminations to conceive were repeat breeder (RB, n=20). Pregnancy rate calculated following 1st insemination in NB and RB cattle was 40% and 20%, respectively, while the pregnancy rate calculated by including maximum three more consecutive inseminations in NB and RB cattle was 80% and 60%, respectively.

By using veonject tube, jugular vein blood sampling was done and serum was collected into two aliquots after complete clotting. Estrus mucus (EM) was collected after cleaning the vulva using a sterile fiberglass catheter fixed to 50 ml sterile plastic disposable syringe. The mucus was centrifuged for 10 min at 3000 rpm for cellular debris removal. The enzyme and glucose estimations were carried out immediately and samples for chemistry analysis were kept in the deep freezer.

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Table 1: Serum and estrus mucus enzymes activities and chemistry of normal and repeat breeder Friesian cattle (n=20 each)

| Parameter | Serum | | Estrus mucus | |
|-------------------|----------------|----------------|----------------|----------------|
| | Normal Breeder | Repeat Breeder | Normal Breeder | Repeat Breeder |
| Glucose, g/dl | 53.8±6.2 | 73.7±2.1* | 15.0±1.9 | 19.0±1.3* |
| Calcium, g/dl | 14.9±0.71 | 11.5±0.75* | 5.2±0.87 | 3.5±0.96 |
| Magnesium, mg/dl | 3.71±0.11 | 4.67±0.11* | 1.6±0.41 | 1.2±0.29 |
| Zinc, µg/dl | 62.6±4.88 | 29.2±6.13* | 0.2±0.07 | 0.2±0.02 |
| Copper, µg/dl | 10.0±0.9 | 10.7±0.9 | 10.1±0.5 | 16.5±6.4 |
| Sodium, mmol/L | 268.9±8.7 | 259.4±2.5 | 76.5±8.6 | 92.4±4.6 |
| Potassium, mmol/L | 4.4±0.7 | 5.47±0.5 | 11.52±0.9 | 11.76±1.3 |
| ALP, iu/ L | 359.6±57.4 | 96.5±13.8* | - | - |
| LDH, u/L | 10.6±2.3 | 17.6±2.3* | 27.6±3.5 | 151.5±42.2* |
| α-Amylase, u/L | 127.0±18.5 | 154.2±34.6 | 7.6±2.31 | 3.7±0.41* |

*p<0.05, between serum or estrus mucus group; ALP, Alkaline phosphatase; LDH, Lactic dehydrogenase

Using spectrophotometer and kinetic kits, enzyme (ALP, Alkaline phosphatase; LDH, Lactic dehydrogenase and α-Amylase) activities in serum as well as estrus mucus were estimated directly. Glucose, minerals (Magnesium, Zinc and Copper) and electrolytes (Sodium and Potassium) were estimated using colorimetric kits (Life science, Salucea, Haansberg, Netherlands). Statistical analysis (Independent sample *t* test) was completed using SPSS-17 version.

RESULTS AND DISCUSSION

Serum calcium and zinc concentrations were low ($p<0.05$), whereas serum glucose and magnesium were high ($p<0.05$) in RB cattle compared to NB cattle (Table 1). However, no difference was observed in estrus mucus calcium and zinc between NB and RB cattle ($p<0.05$, Table 1). In a previous study, copper and zinc were high in NB cattle compared with RB cattle (Modi *et al.*, 2013). Serum as well as estrus mucus electrolytes (sodium and potassium) and trace element (copper) were similar ($p<0.05$) between NB and RB cattle (Table 1). Serum and estrus mucus enzymes activities were variable between NB and RB cattle of the present study (Table 1). In NB cattle,

serum ALP enzyme concentration was high ($p<0.05$) compared with RB cattle. This was in agreement with a previous study in normal breeder cattle (Kalita and Sarmah, 2006). On contrary, serum and estrus mucus LDH enzyme was low ($p<0.05$) in NB cattle compared with RB cattle of present study, as reported earlier also (Vermeiden *et al.*, 1989). Serum α-amylase activity was similar between NB and RB cattle ($p<0.05$); however, estrus mucus α-amylase activity was low in RB cattle ($p<0.05$).

In brief, serum and estrus mucus LDH as well as glucose concentrations were high in repeat breeder cattle, whereas, serum concentrations of calcium, zinc and ALP were high in normal breeder cattle.

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