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Total LDH and isoenzyme pattern in crossbred dairy cows during lactation

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ABSTRACT

Estimation of total LDH and fractionation of isozymes by PAGE were done in the sera of dairy cattle. The level was 696.00 ± 22.97 IU/L during late lactation and 609.50±24.17 IU/L during early lactation. The non- lactating animals showed a value of 435.88 ± 22.14 IU/L. Among the isozymes, LDH 1 decreased, whereas LDH 3,4 & 5 showed an increase during early lactation. The values were also estimated during 1st and 3 subsequent lactations and a non-significant fall was observed. Among the isozymes, LDH 1 showed an increase and LDH 3,4 and 5 recorded a decrease.

Key words: Dairy cows, LDH, Isozymes, lactation

Animal production especially milk production depends on nutrition, hormones and metabolites which in turn affect the cellular enzymes and their metabolic pathways. LDH is one such important enzyme catalyses oxidation of pyruvate to lactate and vice - versa in the presence of NAD/NADH. Electerophoretically five distinct isoenzymes were designated as LDH 1 to LDH 5 in decreasing order of electrophoretic migrations. Estimations of LDH and its correlation with stages of lactation and distribution of LDH isoenzyme in dairy cattle is scanty in literature. The purpose of the present study is to estimate the total LDH and the isoenzymes pattern during different stages of lactation.

MATERIALS AND METHODS

The study was conducted in Jersey x Sindhi cross bred cows maintained at LRS, Kattupakkam. Blood samples were collected from six non-lactating animals, during early and late lactation periods, and from six animals each during different lactation periods. The total LDH activity was estimated colorimetrically by the methods of Wroblenski and Ladue described by Varley *et. al.*, (1998). The isozyme pattern was studied in polyacrylamide Gel electerophoresis (PAGE) as per Westermeier (1997). Routine statistical analysis was followed. The bands were scanned by the densitometer model E.C Densitometer H.P Intergerated - 3395 A and quantification was done by the attached P.C. The values were expressed as percentage of total activity.

RESULTS AND DISCUSSION

The results obtained in the present study are given in Table 1 and 2. Total LDH level was higher during late lactation than early and dry periods. Asmare *et.al.* (1998) and Sarma and Ray (1985) recorded similar findings in dairy cows during late lactations. Increased LDH activity during the lactations indicated the mammary biochemical differences and possible entry of this enzyme from the sites of higher activity. The lower value observed during dry periods is similar to values recorded by Peter *et.al.* (1987) in Holstein Friesian cows. The nutrient consumption and proteins are much lesser during dry periods and is responsible for the reduced activity as per Banuman and Currie (1980).

It is interesting to note that though a progressive decrease observed in the total LDH activity it was not statistically significant. Comparison is not possible as no such work have been carried out in cows. As the number of lactation increase the age of the animal also increase. This reflects a progressive decrease in total LDH. During

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3rd lactation and above these animals, were more than 5 years of age and the values corresponds to the similar observations of Beatty and Doxey (1998).

Table 1: Influence of stages of lactation on total serum LDH and isoenzyme levels

Enzymes	Stages of lactation		
	Non Lactating (Late pregnant)	Early lactation (up to 60 days after calving)	Late lactation (>60 days of calving)
Total LDH (IU/Lit)	435.88±22.14^{a}	609.50±24.17^{b}	696.00±22.97^{c}
LDH 1 %	661.66±1.16^{a}	49.88±2.65^{b}	52.623±1.63^{b}
LDH 2 %	26.06±2.18^{a}	29.81±1.11^{a}	17.088±1.88^{b}
LDH 3 %	10.93±1.54^{a}	14.24±2.59^{ab}	17.088±1.88^{b}
LDH 4 %	1. 16±0.72^{a}	4.58±0.62^{b}	2.046±0.63^{a}
LDH 5 %	0.21±0.12^{a}	1. 49±0.69^{b}	0.38±0.17^{a}

Values with different superscript differ significantly

Table 2: Influence of different lactation number on LDH and isoenzymes levels

Enzymes	Influence of different lactation period			
	I Lactation	II Lactation	III Lactation	IV Lactation
Total LDH (IU/Lit)	623.5.22 ±22.95^{a}	615.5 ±21.13^{a}	602.5 ±15.61^{a}	573.5 ±18.99^{a}
LDH 1%	3.65 ±1.42^{a}	34.85 ±0.58^{a}	41.21 ±1.33^{b}	49.19 ±0.89^{c}
LDH 2%	23.64 ±0.90^{a}	29.51 ±1.42^{a}	32.61 ±0.98^{a}	31.89 ±1.42^{a}
LDH 3 %	23.64 ±0.90^{a}	21.96 ±1.11^{a}	19.82 ±2.04^{a}	15.62 ±1.48^{b}
LDH 4 %	9.61 ±0.52^{a}	10.74 ±0.78^{a}	5.49 ±0.53^{b}	2.68 ±0.53^{b}
LDH 5 %	2.04 ±0.76^{abc}	2.94 ±0.84^{a}	0.86 ±1.18^{bc}	0.64 ±2.29^{t}

Values with different superscript differ significantly

Isoenzyme pattern

Percentage of different isozymes observed are presented in Table I and II. The values of Isozymes LDH 1, LDH 2 were similar to those of the Asmare *et . al.* (1998). The higher values of LDH 4 and LDH 5 recorded during early lactation indicate the involvement of liver. During early lactation, the cows undergo a period of energy deficit and mobilize body resource for milk production. As the liver is the seat of metabolism, the activity of the liver is reflected by higher LDH 4 and LDH 5 Wright and Grammer (1980) predicted pregnancy with high LDH 4 and LDH 5 as marker on 36th day in Hereford cows.

From the isoenzyme level shown in the table 2, the LDH 1 activity increase as the lactation number advances and the trend towards adult pattern having more H subunits was observed. It is interesting to note that LDH 3 , LDH 4 and LDH 5 showed a decline significantly during 3rd and 4th lactation in animals. Under normal management conditions, the animals are fed with lower quantity of feed during the last period of lactation as well as decreased milk production. These animals adjust the metabolism to replenish the body energy stores for the subsequent lactation which might be the season for lower levels of LDH 3,4 & 5 as per Bauman and Currie (1980).

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