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Study the Enzyme and Hormone Profile of Pre-weaned Kids

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A B S T R A C T

This study was conducted to evaluate the impact of age (from birth to three months) on plasma metabolites and minerals in pre-weaned kids. The research was carried out on eight apparently healthy kids (age 0-3 months) of similar physiological status. Blood samples were collected from the experimental animals on 0, 7, 15, 30, 45, 60, 75 and up to 90 days age of kids and analyzed for Plasma enzymes and hormones. Significantly ($p < 0.05$) increased levels of ALT and Acid phosphatase was observed from 0-90th days in kids, while AST and AKP levels were decreased significantly in kids. Thyroxine level decreased significantly ($p < 0.05$) from 0-90th days in kids, while IGF-1 was significant between days.

Introduction

Goat contributes greatly to the agrarian economy, especially in the arid/semi-arid and mountainous regions where crop and/or dairy farming are not economical (Ninan Jacob *et al*., 2012). Goat farming has been recommended as the best choice for the rural people in developing countries because of the low investment, wide adaptability, high fertility and fecundity, low feed and management needs, high feed conversion efficiency, quick pay- off and low risk involved. The neonatal period is one of the most demanding adaptation periods during the life of any animal, including kids. The survival of the newborn depends on rapid adaptations to new environmental conditions which require the establishment of cardiovascular, respiratory, metabolic and thermoregulatory homeostasis mechanisms that are essential for survival and growth (Nowak and Poindron, 2006). The first week post-partum is crucial in all the domestic animals and the newborns remain in metabolically unstable status. In the case of kids, neonatal mortality and morbidity seem to be relatively higher than in other farm species, in particular during the first days of life (Piccione *et al*., 2008). Good management techniques and early intervention, diagnosis and treatment could prevent a substantial proportion of neonatal diseases or death. The information on enzyme and hormonal status of

pre-weaning kids are very scanty. Therefore the research was planned to figure out the status of the pre-weaned kinds in respect to enzyme and hormonal status.

Materials and Methods

The research was approved by the Institutional Animal Ethics Committee (IAEC, No.: 256/VPY/2016). The present study was conducted in the Department of Veterinary Physiology and Biochemistry, College of Veterinary Science and A. H., Anand Agricultural University, Anand on eight pre-weaned (birth to three months of age)kids maintained at Instructional Livestock Farm Complex (ILFC) of Department of Livestock Production Management at College of Veterinary Science and A.H., Anand. The experimental animals were reared in semi-open housing system which is made up of a concrete floor under asbestos roofed housing system constructed east-west direction and well covered with trees. These experimental animals were separated from other animals in pakka shed house. The experimental animals were maintained on ICAR feeding standards, 1998. Five ml of whole blood samples were collected from the experimental animals on 0, 7, 15, 30, 45, 60, 75 and up to 90 days age of kids. Samples were collected aseptically from the jugular vein in heparinized vacutainer . Plasma was separated by centrifugation at 3000 rpm for 15 minutes and stored at -20 ℃ in deep freeze until analyzed for plasma enzymes and hormones The plasma enzymes Aspartate Transaminase, Alanine Transaminse, Alkaline Phosphatase, Acid Phosphatase etc. were estimated by using Diagnostic kits manufactured by Crest Biosystems, Coral Clinical Systems, Goa, by Spectrophotometer (model Visiscan 167) and BS-120 biochemistry analyzer. Endocrinological parameters like Triiodothyronine (T3) Thyroxine (T4), Cortisol were estimated by standard RIA technique in the Dept. of Reproductive Biology Research Unit, College of Veterinary Science and A.H., AAU, Anand. While, IGF-1 was estimated by ELISA method using Bovine IGF-1 ELISA kit (Cat. No: MBS028594 manufactured in Sandiego, USA). The data was analyzed using a completely randomized design (CRD) and significance was tested by Duncan's New Multiple Range Test (DNMRT).

Results and Discussion

In the present study, we observed that the mean Alanine Transaminase (ALT) (U/L)of kids were ranged from 8.34 ± 0.72 to 24.20 ± 2.87 with the mean value of 17.74 ± 1.20 from birth to three months of age which was significant. The lowest level of ALT was found on the 15th day. Whereas, the highest concentration of ALT was observed on the 90th day. A level of ALT found on the 90th day was significantly ($p< 0.05$) higher as compared to the level of ALT on the 8th day of life. Aspartate Transaminase (AST) (U/L) level was ranged from 244.63 ± 43.17 to 493.44 ± 46.59 with the mean of 402.37 ± 15.34 from birth to three months of age which was significant. The highest and lowest concentration of AST was found on 75th and 90th day respectively. We also found that the level found on the 75th day does not differ significantly with the level found on 0 days but the lowest level which was observed at the 90th day was differed significantly ($p< 0.05$) to all other days except 30th day. Alkaline Phosphatase (AKP) of kids ranged from 24.40 ± 1.78 to 36.83 ± 3.64 with the mean of 31.38 ± 0.93 from birth to three months of age which was significant. The alkaline phosphatase level was significantly ($p< 0.05$) higher on the day of birth as compared to the 15th day of age. A significant reduction in AKP level was found on the 15th day. Thereafter, non-significant differences were observed until the 90th day. The level of Acid Phosphatase

(ACP) of kids ranged from 24.36 ± 2.04 to 36.71 ± 1.16 with a mean of 28.09 ± 0.84 from birth to three months of age which was significant. The lowest and highest concentration of ACP was observed on 30th and 90th day. The level of ACP did not differ significantly from birth till the 60th day. After that significant ($p< 0.05$) increase in ACP was recorded on 75th day which again increased non-significantly on the 90th day (Table 1).

The plasma concentration of T3 (ng/ml) was ranged from 404.63 ± 67.65 to 715.00 ± 92.71 with the mean of 612.63±46.24 from birth to three months of age which was non-significant. We observed the highest and lowest Triiodothyronine (T3) concentration on the 7th day and 90thdayrespectively but the differences observed were non-significant. The plasma concentration of T4 (ng/ml) was ranged from 74.40 ± 6.93 to 132.87 ± 22.29 with a mean of 94.37 ± 4.29 from birth to three months of age which was significant. We observed the highest level of T4 on 0 days which was decreased significantly ($p< 0.05$) on the 7th day which is the lowest level observed during the study. Thereafter non-significant differences were recorded till the 90th day.

The mean plasma concentration of cortisol (ng/ml) was ranged from 17.47 ± 2.19 to 22.53 ± 1.73 with the mean of 20.15 ± 0.59 from birth to three months of age which was non-significant. The level was higher on the day of birth in kids (Table 2).

We observed the highest and lowest Cortisol concentration day 0 day and 7th day respectively but the differences observed were non-significant. The mean plasma concentration of IGF-1 (ng/ml) was ranged from 9.3 ± 1.17 to 31.2 ± 4.96 with the mean of 23.95 ± 1.44 from birth to three months of age which was significant. We observed the highest and lowest IGF-1 concentration on the 90th day and 75th day respectively. The lowest level of IGF -1 which was observed on the 75th day differed significantly with the levels of IGF-1 observed on all other days. Mbassa and Poulsen (1991) also observed that plasma ALT activities increased gradually with age as observed in the present study from 30th to 90th day.

Table.1 Mean (±SEM) values of enzymes in kids (n=8) from birth to 90 days

Days	Alanine Transaminase (U/L)	Aspartate Transaminase (U/L)	Alkaline Phosphatase (U/L)	Acid Phosphatase (U/L)
0	15.45^{bc}±2.40	444.49^{bcd}±38.19	36.83^{d}±3.64	26.35^{a}±1.01
7	20.09^{bc}±6.94	463.68^{cd}±25.31	31.91^{bcd}±2.26	24.65^{a}±2.60
15	8.34^{a}±0.72	371.95^{bc}±28.70	24.40^{a}±1.78	26.19^{a}±2.11
30	12.29^{b}±2.69	340.68^{ab}±28.05	29.95^{abcd}±2.07	24.36^{a}±2.04
45	21.24^{c}±1.64	418.18^{bcd}±39.92	29.20^{abc}±2.26	26.65^{a}±2.20
60	19.43^{bc}±1.12	441.92^{bcd}±33.85	28.08^{ab}±2.88	26.68^{a}±2.60
75	20.92^{bc}±1.15	493.44^{d}±46.59	36.03^{cd}±1.59	33.13^{b}±1.49
90	24.20^{c}±2.87	244.63^{a}±43.17	34.65^{bcd}±1.45	36.71^{b}±1.16
GM	**17.74 ± 1.20**	**402.37 ± 15.34**	**31.38 ± 0.93**	**28.09 ± 0.84**
CV%	**48.90**	**25.45**	**21.10**	**20.00**
$CD_{0.05}$	**8.72**	**102.90**	**6.65**	**5.65**

Values having different superscripts differed significantly ($P < 0.05$) within column

Table.2 Mean (±SEM) values of hormones in kids (n=8) from birth to 90 days

Days	Triiodothyronine (ng/ml)	Thyroxine (ng/ml)	Cortisol (ng/ml)	IGF-1 (ng/ml)
0	6.19±0.51	132.87^{b}±22.29	22.53± 1.73	27.2^{b}±4.98
7	7.15±0.93	74.40^{a}±6.93	17.47±2.19	29.1^{b}±5.74
15	6.63±0.91	79.25^{a}±8.57	18.73±1.24	23.6^{b}±1.76
30	6.78±1.99	85.28^{a}±7.57	19.82±2.06	22.4^{b}±2.44
45	6.53±1.44	103.24^{ab}±9.32	20.23±1.86	23.1^{b}±3.04
60	6.42±2.11	92.07^{a}±8.24	21.86±1.66	25.7^{b}±1.51
75	5.27±1.22	86.15^{a}±8.58	20.09±0.66	9.3^{a}±1.17
90	4.05±0.68	101.69^{ab}±8.87	20.50±1.56	31.2^{b}±4.96
GM	**6.13±0.35**	**94.37 ± 4.29**	**20.15 ± 0.59**	**23.95 ± 1.44**
CV%	**61.92**	**33.22**	**23.63**	**42.65**
$CD_{0.05}$	-	**31.50**	**-**	**10.27**

Values having different superscripts differed significantly (P < 0.05) within column

Alanine aminotransferase (ALT) is usually measured concurrently with Aminotransferase (AST) as part of a liver function panel to determine the source of organ damage. AST is an enzyme that's present in various tissues of your body. An enzyme is a protein that helps trigger chemical reactions that the body needs to function. The increase in the AST enzyme with age is probably a consequence of the increasing body mass and might be due to intensifying the metabolic activity (Antunovic *et al*., 2012). Mbassa and Poulsen (1991) observed that plasma AST activities increased gradually with age in goat kids. Higher values of ALP found in the first 90 days of life which might be due to the more intense bone remodeling, and leakage of the enzyme from the growing bones and intestines into the blood. Similar results were also obtained by Kurz and Willet (1991) and Retskii (2005). The higher level of AKP in serum on the day of birth was most likely due to absorption of colostrum which causes activation of enzymes in the intestine. Thus, serum alkaline phosphatase appeared to be from intestinal sources and/or colostrum could be stimulating the intestinal alkaline phosphatase activity. The reduced thyroid hormone concentration after birth may be due to both direct effects of heat stress on thyroid gland activity as well as due to reduced feed intake in these animals that are important for maintaining the thermal balance during heat stress. The reduced feed intake and lower level of thyroid hormones could be the adaptive mechanism exhibited by these animals to prevent additional heat load since the increased activity of these metabolic hormones might add to the load in these animals. Cortisol secreted by the adrenal cortex is an important hormone related to inflammation and stress. Cortisol levels in goats range 14-18ngmL (Kannan *et al*., 2000). We had observed the little higher level of cortisol in kids which may be due to environmental stress just after birth. There were no any significant differences were observed in cortisol level which indicates the experimental goats were free from any inflammatory condition and had minimum stress. High plasma cortisol values at birth are indicating cortisol hypersecretion by the fetal adrenal glands (Celi *et al*., 2008).

Since insulin-like growth factor 1 (IGF-1) can play a fundamental role in post-natal development. We had observed the non-significant differences in IGF levels during the study period. The results obtained for IGF-1 in the present study were higher than that reported by Ashour *et al*., (2015) in Ossimi lambs and Damascus kids.

The conclusion drain from this research was that the levels of ALT and ACP increase Significantly ($p < 0.05$) from 0-90th days in kids, while the AST and AKP levels showed a decreasing trend.

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