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Variations in Some Plasma Macro and Micro Elements Concentrations During Different Ages of Iranian Sarabi Calves

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Abstract: Elements have key roles in regulating of metabolism in various tissues of domestic animals; therefore, the determination of these elements concentrations is very important in evaluation of their deficiency in different ages of animals. The aim of this study was to determine the concentrations of calcium, magnesium, zinc and copper during different ages and of different sexes in plasma of Sarabi calves. Blood samples were collected from the jugular vein of 45 clinically healthy animals, aged 1-14 days, 1-2 and 3-6 months in autumn. The plasma was analyzed to determine calcium, magnesium, zinc and copper concentrations by spectrophotometry method using commercial kits. Results indicated that there was no significant difference among age groups concerning the all studied parameters. Additionally, there was no a significant difference among two sexes concerning the aforementioned parameters, except for calcium ($P < 0.05$) and the concentrations of calcium, magnesium, zinc and copper were higher in female than male animals. In conclusion, the concentrations of plasma calcium, magnesium, zinc and copper were not significantly altered by physiological and metabolically changes during the first six months of age in Sarabi calves; but, it seems that the concentrations of all studied parameters, especially calcium, were affected by similar changes related to sex during the same age interval.

Key words: Calcium. Magnesium. Zinc · Copper · Calve

INTRODUCTION

Macro and micro elements are inorganic substances and essential to maintain the normal function and living status in various tissues of domestic animals [1- 5]. These elements are needed for physiological processes related to health, growth and reproduction, such as the regular function of immune system, hormone production, tissue synthesis, enzyme activity, energy production, vitamin synthesis, neuromuscular transmission, milk production and blood coagulation [1- 6]. The levels of these elements are affected by many metabolic events in the body [7]. As well as, some of the endogenous factors (e.g. species, breed, age and gender) and soil characteristics may be directly or indirectly affects the plasma macro and micro elements concentrations in livestock [5, 8]. Nutritional deficiencies and disturbances of these elements cause variety of important diseases in domestic animals [1, 9]. Sarabi cows are the pure forms of the original types of native cow which was reared in Eastern Azarbaijan province, northeastern Iran. There is no published information about the variation of plasma calcium, magnesium, zinc and copper concentrations during different ages of Sarabi calves. So, the main objective of this study was to determine the change of above mentioned elements concentrations between two sexes during the first six months of ages in Iranian Sabrabi calves.

MATERIALS AND METHODS

This research was carried out on blood samples collected from the forty-five Sarabi calves reared at the Sarabi cow Improvement Center located in East Azarbaijan

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province, northeastern Iran. Animals were clinically healthy, free from internal and external parasites. The calves were divided into three age groups (1-14 days, 1- 2 and 3-6 months) and by gender. Blood samples were taken from the jugular vein into heparinised vacuum container (Becton Dickinson, NJ, USA). All blood samples were collected in autumn and their plasma were separated by centrifugation at 750 × g for 15 min, immediately. The concentrations of all studied elements were determined by spectrophotometry method using commercial kits. The data were analyzed by one-way analysis of variance (ANOVA) using SPSS/ver.17 software and Duncan's multiple range tests was used to detect significant differences among means. All values shown as mean ± standard deviation (SD). As well as, the lower and upper values of measured elements were estimated using the 95 % confidence limits (CL) for the mean of their concentrations in each age group.

RESULTS

The study demonstrated that plasma calcium, magnesium, zinc and copper concentrations had no significant variation during the first six months of ages in Iranian Sarabi calves. Also, the lowest concentration in all of the studied parameters was found in aged 1-14 days animals, except to calcium. The mean ± SD and lower and upper values of the measured macro and trace elements in different age groups are presented in Tables 1 and 2, respectively. Additionally, the values of above mentioned

Table 1: The plasma concentrations of calcium and magnesium and their 95 % confidence limits (CL) of the mean during different ages of Iranian Sarabi calves

Group	N		Calcium(mmol/l)	Upper and lower95 % CL	Magnesium(mmol/l)	Upper and lower95 % CL
1-14 days	15	Mean	2.85	2.75 - 2.95	0.56	0.42 - 0.70
		SD	0.05		0.07	
1-2 months	15	Mean	2.48	1.44 - 3.52	0.73	0.43 - 1.03
		SD	0.52		0.15	
3-6 months	15	Mean	2.77	2.65 - 2.85	0.70	0.48 - 0.92
		SD	0.05		0.11	
Total	45	Mean	2.66	1.94 - 3.38	0.70	0.28 - 0.92
		SD	0.36		0.21	

Table 2: The plasma concentrations of zinc and copper and their 95 % confidence limits (CL) of the mean during different ages of Iranian Sarabi calves

Group	N		Zinc(ìmol/l)	Upper and lower95 % CL	Copper(ìmol/l)	Upper and lower95 % CL
1-14 days	15	Mean	8.01	4.21 - 11.81	15.92	6.02 - 25.82
		SD	1.90		4.95	
1-2 months	15	Mean	13.01	1.95 - 24.06	16.54	7.98 - 25.10
		SD	5.53		4.28	
3-6 months	15	Mean	12.42	1.74 - 23.10	16.45	6.25 - 26.65
		SD	5.34		5.10	
Total	45	Mean	12.11	1.79 - 22.43	16.40	6.84 - 25.96
		SD	5.16		4.78	

Table 3: The plasma concentrations of calcium, magnesium, zinc and copper of Iranian Sarabi calves according to gender.

Group	Gender	N		Calcium(mmol/l)	Magnesium(mmol/l)	Zinc(ìmol/l)	Copper(ìmol/l)
	Male	8	Mean	2.85	0.46	8.01	15.92
1-14 days			SD	0.05	0.07	2.01	4.95
	Female	7	Mean	2.85	0.46	8.05	15.92
				0.05	0.07	1.90	4.95
	Male	7	Mean	2.06	0.42	11.96	13.78
1-2 months			SD	0.70	0.22	6.78	1.87
	Female	8	Mean	2.73	0.76	13.64	18.19
				0.06	0.28	8.66	7.04
	Male	7	Mean	2.74	0.63	8.80	13.21
3-6 months			SD	0.03	0.10	2.53	5.44
	Female	8	Mean	2.80	0.57	16.05	19.69
				0.05	0.13	5.00	1.73
	Male	22	Mean	2.45 [a]	0.54	10.15	13.45
Total			SD	0.54	0.18	4.62	4.01
	Female	23	Mean	2.78 [b]	0.62	13.03	18.13
			SD	0.07	0.22	6.67	5.10

* There are significant differences among groups with different codes in a column (a, b) in each parameters (P<0.05)

parameters in each age group according to gender are presented in Table 3. There was only a significant difference among sexes concerning the plasma calcium concentration ($P < 0.05$) and the concentrations of all measured parameters were higher in females than males calves.

DISCUSSION

In the present study, the mean of plasma calcium values for total samples showed a little difference with the other values reported in cow [10- 14] and lower than the values reported in calve [15] and sheep [8]. The level of magnesium was lower than the values reported in cow [10, 11, 13, 14], buffalo [15] and camel [16]. However, our results are consistent with some of the values reported in cow [12, 17]. The level of plasma copper was higher than the other reports in cow [5, 10, 14], calve [18] and sheep [8, 19]. Similarly, the concentration of zinc in plasma of Sarabi calves was higher than the values previously reported in cow [10, 13, 20] and sheep [19], but was consistent with the values reported in Awassi sheep [21]. Age had no significant effects on plasma calcium, magnesium, zinc and copper concentrations in Iranian Sarabi calves; with values being higher in younger animals, except to calcium. This finding was consistent with the other reports about the age-dependent variations of these plasma elements in other breeds of Iranian cows and horse [11] and sheep [8]. We showed a significant gender-dependent variation only in plasma calcium concentration of Sarabi calves. Gender- related differences have been reported in Iranian sheep [8]; but, our result was no consistent with previous report in other breeds of Iranian cow [11]. Overall, many endogenous and exogenous factors effects directly or indirectly on blood elements concentrations in livestock. These factors are including: species, breed, gender, age, physiological and metabolically status, diseases, nutrition, climate, soil characteristics and interrelationship between elements [1, 2, 5, 9, 20-32]. As the complex and synchronous effects of endogenous and exogenous factors impact on the studied parameters in our research, the exact explanation of these finding is not possible.

In conclusion, it seems the breed, gender and nutritional differences and also their related physiological and metabolically changes may have the highest effect on our results, especially on calcium levels.

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