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EFFECTS OF THE PHYSIOLOGICAL STATUS AND SELENIUM AND VITAMIN E INJECTION DURING TRANSITION PERIOD ON SERUMPROTEINS PARAMETERSIN CAMELS (*CAMELUS DROMEDARIUS*) REARED UNDER SEMI- INTENSIVE SYSTEM

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1. Abstract

The objective of the study was to investigate the effect of the physiological status and selenium (Se) and vitamin E (Vit. E) injection during the transition period (late pregnancy, at parturition and postpartum) on serum proteins parameters (total proteins, albumin, globulinsand A/G ratio) in camels (*Camelusdromedarius*) reared under semi-intensive system. Twenty clinically healthy time-mated pregnant females of three local breed: Arabi, Kenani and Deali (age 7-11year, number of parities: 2-3) were used. The animals were divided into 2 equal groups (10 each), as control and treated group. The treated group was injected intramuscularly with 10 ml of a combination of Se + Vit. E (0.6 mg/ml of sodium selenite and 80 mg/ml of vitamin E acetate, LABORATORIOS CALIER, Spain) three times: one month before parturition, at parturition and one month postpartum. Jugularvenousblood samples were collected at the same time of the injection for the determination of serum total proteins and albumin and for the calculation of serum globulins concentration. During late pregnancy, serum total proteins correlated positively ($P<0.05$) to serum globulins of the control group.At parturition, serum total proteins correlated positively ($P\leq0.05$) to serum albumin and globulins of both control and injected groups and to serum globulins of injected group only during the postpartum period ($P<0.01$). Intramuscular injection of Se + Vit. E during the transition period caused a significant ($P<0.05$) increase in serum total proteins, albumin, globulins and A/G ratio. It was concluded that serum proteins parameters were influenced by the transition period.Intramuscular injection of Se + Vit. E during the transition period enhanced the intracellular antioxidant status, which reflected positively on the metabolic activity of female camels. The data can be utilized to improve health and productivity of female camels during the critical transition period that associated with physiological oxidative stress.

Key words: *Dromedary camels, transition period, selenium and vitamin E, serum proteins*

2. Introduction

Transition period in animals is defined by many researchers as the period from late pregnancy to early lactation (Bell, 1995; Goff and Horst, 1997; Shrama et al., 2011; Zebeli et al., 2015). Transition period is also considered as one of the most critical periods for health and productivity in farm animals (Drackley 1999; Garverick et al., 2013; Esposito et al., 2014) as well as stressful condition leads to metabolic stress, which interferes with intracellular homeostasis (Gitto et al., 2002;Castillo et al., 2005;AbdEllah, 2016). High metabolic demands associated with late pregnancy, parturition, and initiation of lactation would be expected to increase the production of reactive oxygen species(Sordillo and Aitken, 2009), which may lead to an oxidative stress(Shrama et al., 2011; AbdEllah, 2016). It is well known that during pregnancy some metabolic changes occur, which may alter the physiological range of some serum constituents (Jainudeen and Hafez, 1994; El-sherif and Assad, 2001; Khan and Ludri, 2002) to satisfy the demands of the foetus, the placenta and the uterus. Significant variations in the serum total protein concentration have been reported previouslyduring pregnancy in camels (Seri et al., 2015; Ahmed, 2017).Eltohamy et al., (1986) reported that serum total protein concentration increased with the advancing pregnancy in camels. Moreover, Kelanemer et al., (2015) reported higher level of serum total protein during late pregnancy compared with postpartum period in camels. In contrast, Saeed et al., (2009) found that pregnant camels had lower values of total proteins and albumin with no change in the globulins concentration compared with non-pregnant camels.

Seleniumand Vitamin E (Se and Vit. E) are essential nutrients that have complementary biological functions as antioxidants to minimize cellular damage caused by endogenous free radicals (Kolb et al., 1997;Sordillo, 2013). Under field conditions, Se + Vit.E deficiency is usually manifested by an increased incidence of reproductive disorders, infertility and increased susceptibility to infections (Hosnedlova et al., 2017). In young animals, selenium deficiency alone or with Vit. E deficiency has been demonstrated by white muscle disease (Mehdi et al., 2013).

In farm animals, supplementation with Se + Vit.E during transition period caused a significant enhancement in the metabolism as indicated by increasing in serum proteins parameters. Many investigators have concluded that plasma total proteins and globulins

were increased significantly in Se + Vit. E -injected ewes and their lambs compared to the control groups (Soliman et al., 2012). Moreover, El-Shahat and Abd El-Monem, (2011) reported that Baladi ewes supplemented with Se + Vit. E 2 weeks before mating and during pregnancy till lambing resulted in a significant increase in serum total proteins and globulins compared to the control group and group supplemented with Se or VE alone. In addition, higher levels of total proteins and albumin have been reported following Se + Vit. E supplementation in pregnant ewes and their lambs (Pisek et al., 2008; Avci et al., 2000).Moreover, dietary supplementation with Se, Zn and Vit.E caused a significant increase in serum total proteins and gamma globulins concentrations in goat kids (Abou-Zeina et al., 2014). However, parenteral supplementation with Se had no effects on the concentrations of serum total proteins in neonatal dairy calves (Mohri et al., 2005).

To date no data is available regarding the use of a combination of injectable Se and Vit. E during the transition period in female dromedary camels or to investigate their effects on serum proteins parameters (plasma total proteins, albumin, globulins and A/G ratio). Therefore, the study was aimed to investigate the effect of the physiological status and intramuscular injection of Se + Vit. E during the transition period on serum protein parameters in dromedary camels.

3. Materials and Methods

3.1 Animals and management:

Twenty clinically healthy pregnant female camels of three local breed (age 7-11year, number of parities: 2-3)were used. The animals belonged to Camel Research Centre, Faculty of Veterinary Medicine, University of Khartoum.The Animals were maintained on grazing andbrowsing trees and shrubs in the vicinity of the camel Centre and occasionally received concentrate supplements and roughages with free access to fresh water. Time-mated pregnant camels were divided into 2 equal groups (10 each), as control and treated group. The treated group was injected intramuscularly with 10 ml of a combination of Se and Vit. E (0.6 mg/ml of sodium selenite and 80 mg/ml of vitamin E acetate,LABORATORIOS CALIER, Spain) three times: one month before parturition, at parturition and one month postpartum.

3.2 Blood Collection and Laboratory Analysis:

Venous blood samples were collected using plastic syringes (7.5 ml, Pirmvetta®, Laboratory Technique, GmbH, Germany) three times: one month before parturition, at parturition and one month postpartum. The blood samples were centrifuged and the serum was collected in sterile containers and used for the determination of plasma total proteins and albumin (Biuret and Bromcresol green spectrophotometric methods according to Weichselbaum, 1947 and Doumas et al., 1971, respectively)using commercial kits (Spinreact, Spain). Serum globulins were calculated by subtracting the serum- [Albumin] from the serum- [Total protein].

3.3 Statistical analysis:

Statistical analysis was performed using SPSS for Windows version 20.0 using General Linear Model (GLM) descriptive statistics procedures. ANOVA tests (Levine's Test and Post Hoc Test) of the same programme were used to assess the possible significant differences between the mean values in different periods and between the control and the injected groups. A correlation was performed to explain the relationship between the parameters investigated. The mean difference was considered significant at $P \leq 0.05$.

4. Results

The correlation between serum protein parameters during the transition period and as influenced by intramuscular injection of Se and Vit. E in camels is shown in Table1. During late pregnancy, serum total proteins(TP) correlated positively ($P<0.05$) to serum globulins of the control group. At parturition, serum total proteins correlated positively ($P\leq0.05$) to serum albumin and globulins of both the control and injected groups and to serum globulins of the injected group only during the postpartum period ($P<0.01$).

Table 2and Fig. 1 show that intramuscular injection of Se and Vit. E during the transition period caused a significant ($P<0.01$) increase in the serum-[TP] at parturition and one month postpartum period compared to the control group. Serum-[Albumin] and [Globulins] increased significantly ($P <0.05$) at parturition and one month postpartum in the injected group compared to the control group (33.7 and 30.0 g/l, respectively). The A/G ratio decreased significantly ($P<0.05$) at parturition and one month postpartum in the injected group compared to the control group.

Table 1. Correlation between serum protein parameters during the transition period and as influenced by intramuscular injection of selenium and Vitamin E in camels (*Camelusdromedarius*) (n=20)

Physiological status	Group	Parameters	Pearson Correlation	Level of significance
Late pregnancy	Control	[TP]-[Albumin]	0.235	0.576
		[TP]-[Globulins]	0.791*	0.019
	Injected	[TP]-[Albumin]	0.615	0.078
		[TP]-[Globulins]	0.664	0.051
Parturition	Control	[TP]-[Albumin]	0.615	0.078
		[TP]-[Globulins]	0.722*	0.028
	Injected	[TP]-[Albumin]	0.875**	0.001
		[TP]-[Globulins]	0.296	0.407
One month Postpartum	Control	[TP]-[Albumin]	0.368	0.417
		[TP]-[Globulins]	0.742	0.056
	Injected	[TP]-[Albumin]	0.577	0.104
		[TP]-[Globulins]	0.812**	0.008

Brackets ([ ]) donate concentration, TP: Total protein

Correlation is significant at * the 0.05 level and ** at the 0.01 level (2-tailed).

Table 2. Serum protein parameters during the transition period and as influenced by intramuscular injection of selenium and vitamin E in camels (*Camelusdromedarius*) (n=20)

Parameter	Group	Late pregnancy	Parturition	One month postpartum	Reference range
Serum- [TP] (g/l)	Control	59.9 [a] ±11.2	55.6 [a] ±8.3	57.3 [a] ±6.6	51-74 *
	Injected	64.8 [b] ±5.3	63 [b] ±7.7	64.9 [b] ±9.2	
Serum- [Albumin] (g/l)	Control	40.5 [a] ±7.5	37.4 [a] ±5.7	37.5 [a] ±4.5	26-38.9 *
	Injected	41.4 [b] ±4.1	41.6 [b] ±7.5	43.1 [b] ±5.3	
Serum- [Globulins] (g/l)	Control	19 [a] ±11.9	18.1 [a] ±6.5	19.4 [a] ±6.6	
	Injected	23.3 [b] ±4.5	21.4 [b] ±3.8	21.8 [b] ±7.5	
A/G ratio	Control	3.72 [a] ±3.6	2.38 [a] ±1.2	2.31 [a] ±1.4	0.6-1.2**
	Injected	1.89 [b] ±0.5	2.01 [a] ±0.6	2.18 [a] ±0.7	

Brackets [ ] donate concentration, TP: Total protein

Mean values within the same row bearing different superscripts are significantly different at ($P \leq 0.05$).

Reference range: (* Elkhair, 2016 and ** Elkhair and Hartmann, 2014)

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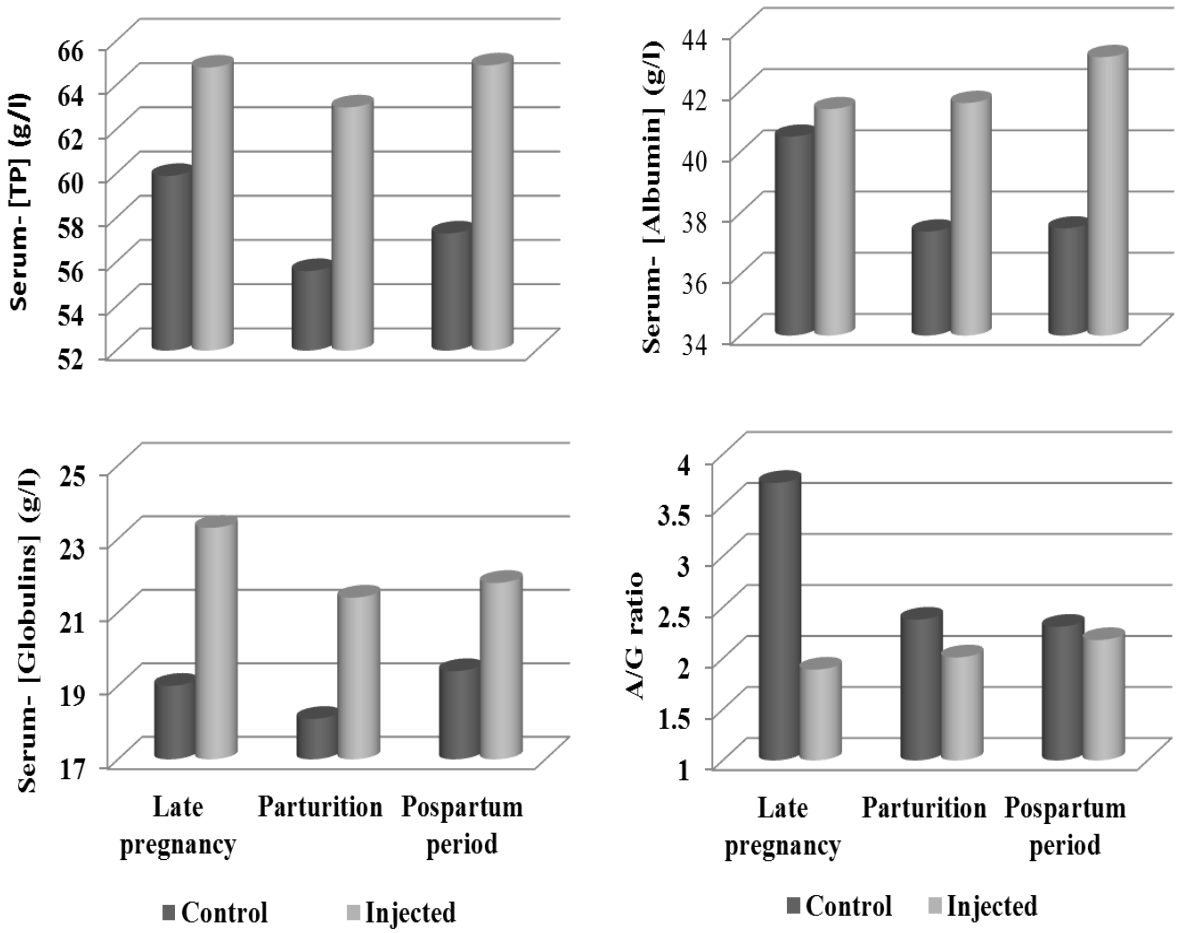

Fig.1 Serum protein parameters during the transition period and as influenced by intramuscular injection of selenium and vitamin E in camels (*Camelus dromedarius*) (n=20)

5. Discussion

The data obtained in the present study demonstrate that protein parameters were influenced by the transition period in dromedary camels as adaptive physiological mechanisms associated with rapid foetal growth and lactogenesis. In addition, the present results showed that intramuscular injection of Se + Vit. E during the transition period has been successfully used to improve the physiological performance of female dromedary camels as indicated by an increase in serum proteins parameters.

Serum metabolites are known to be changed during pregnancy as a result of dam and foetus requirement (King, 2000; Tanritanir et al., 2009). Serum proteins parameters such as total proteins, albumin and globulins obtained in this study were within the normal

range of dromedary camels (AL-Busadah, 2007; Elkhair 2016). The results obtained in the present study showed dynamic changes in the concentration of serum proteins parameters during the transition period; the lowest concentration of serum TP, albumin and globulins was observed at parturition. In all animal species, pregnancy is characterized by intense metabolic alterations on many variables related to protein metabolism (Iriadam 2007; Tothova et al., 2018), which have been observed in the present study. The significant decrease in serum proteins during the transition period has been reported previously in camels (Tharwat et al., 2015; El Zahar et al., 2017), cattle (Piccione et al., 2012; Tothova et al., 2018), ewes (Antunovic et al. 2002)and goats (Janku et al.2011). Abd-El-Rahman et al., (2017) noted that the lower serum protein concentration observed during late pregnancy in camels mightbe caused by the utilization of amino acids from the maternal circulation for protein synthesis in the foetal muscles.

In the control group, the present results show a noticeable significant decrease in TP at parturition. This pattern of TP response could be related to the observed hypalbuminaemia. Also it could be attributed to as a result of gamma globulins transfer to colostrum as indicated by hypoglobulinaemia observed. Similar lower values of TP have been reported previously in pregnant camels (Saeed et al., 2009; Khadjeh 2001). Tharwat et al., (2015) noted that thesignificant increase in serumglobulins during postpartum in camels may be resulting from the formation of immunoglobulins. Moreover, the gradual non-significant decrease in A/G ratio in the control group explained the shift in the concentrations of albumin and globulinswith the highest values during late pregnancy, which may also reflect the transport of immunoglobulins and some proteins to the mammary gland. In sheep, Roubies et al.,(2006) explained the lower concentrations of TP at parturitionas a result of immunoglobulins transferfrom the bloodstream to the mammary gland for the synthesis of colostrum and milk.

The results obtained in the present study showed that intramuscular injection of Se and Vit. E during the transition period caused a significant increase in serum total protein, albumin and globulin concentrations. The higher concentration of serum total proteins in the injected group could be due to the role of Se in protein synthesis (Abou-Zeina et al., 2014). Moreover, Se is known as an essential component of range of selenoproteins (Andrieu, 2008). Selenoproteins in which selenium is present as selenocysteine, represent an important role in many body functions, such as the production and reproductive properties,

antioxidant defence and the formation of thyroid hormones (Mehdi et al., 2013).The results were in agreement with previous findings in pregnant ewes (Avci et al., 2000), buffaloes (Helal et al., 2009), ewes (El-Shahat and Abd El-Monem, 2011) and crossbred dairy cows (Abdalla, 2014). However, Shinde et al., (2009) found that dietary supplementation of Se and Vit. E had no effect on serum total protein and globulin concentrations in the buffalo calves.

Conclusions

It was concluded that serum proteins parameters were influenced by the transition period. Intramuscular injection of Se + Vit E during the transition period has been successfully used to improve the physiological performance of female dromedary camels as indicated by the increase serum proteins parameters. Intramuscular injection of Se +Vit.E during the transition enhanced the intracellular antioxidant status, which reflected positively on the metabolic activity of pregnant dromedary camels. The data can be utilized to improve health and productivity in female camels during the critical transition period that associated with physiological oxidative stress.

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Conflict of interest: The authors declare that they have no conflict of interest

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