CHANGES IN SOME HEMATOLOGICAL AND SERUM BIOCHEMICAL PARAMETERS DURING THE FIRST WEEK AFTER LAMBING IN SIX CONSECUTIVE PARITIES IN SOME EGYPTIAN SHEEP BREEDS

M.M. Anwar[1], A.N.M. Nour El-Din[2] and T.A. Taha[2]

1- Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, 2-Department of Animal Production, Faculty of Agriculture, (El-Shatby), Alexandria University 21545, Alexandria, Egypt

SUMMARY

This study was carried out at the Agricultural Experimental Station, Department of Animal Production, Faculty of Agriculture, Alexandria University. It aimed to determine the effect of breed and parity on some hematological and biochemical parameters during the first week of lactation throughout six consecutive parities in some Egyptian sheep breeds. A total of 108 ewes of three breeds, Barki, Rahmani and Barki x Rahmani crossbreed (36 ewes per each breed and 6 ewes per each parity within breed) were used. Blood samples were collected every other day during the first week of lactation. Results demonstrated that Rahmani and crossbred ewes had higher Hb concentration compared to Barki ewes. There were significant differences (P < 0.05) among all sheep breeds in PCV %. Rahmani ewes had the highest PCV %, while Barki ewes had the lowest values. The crossbred ewes had greater (p < 0.05) MCHC than the other two pure breeds. Hemoglobin concentrations were higher (P < 0.05) in the ewes during the third and fifth parities than those in the other parities, while PCV and MCHC % fluctuated and recorded the highest values in ewes at the fifth and third parities, respectively. Rahmani ewes had greater (P<0.05) serum total protein and albumin concentrations than both Barki and crossbred ewes, while serum total lipids and cholesterol concentrations were higher (P< 0.05) in Barki ewes compared those of Rahmani and crossbred ewes. On the other hand, crossbred ewes showed higher (P<0.05) serum glucose, AST and ALT enzyme activities than the two pure breeds. Ewes, in the third parity, showed greater (P<0.05) serum albumin, cholesterol, AST and ALT than those of other parities. Low serum total protein concentrations were noted in the ewes at the second and third parities. Serum glucose concentrations were high in the first day of lactation, then decreased (P<0.05) sharply from the third day of lactation. Within the first day of lactation, ewes in the first parity recorded the lowest glucose concentrations, which were increased with increasing the parity of the different three breeds. Both Rahmani and crossbred ewes had higher hemoglobin concentrations and PCV % than Barki ewes; this may be reflected on the productivity and adaptability of each breed to their environment.

Keywords: Sheep, Postpartum, Parity, Hematology, Serum constituents

INTRODUCTION

Ewes should be in good health and normal conditions during early lactation period to insure the production of sufficient colostrum and milk for nursing lambs. Metabolic profiles have been used to predict postpartum metabolic problems, and for the diagnosis of metabolic diseases and the assessment of nutritional status of animals (Bahkci *et al*., 2007). For example, the requirement for glucose increases considerably during lactation, where large quantities of glucose are removed by mammary glands for lactose synthesis (Roubius *et al*., 2006). El-Sherif and Assad (2001) demonstrated that total plasma protein of lactating ewes declined to reach level equal to that of dry ones. This decline was attributed to the sharp decrease in globulin that had lower level than that of non-lactating ewes (Takarkheade *et al*., 1999). Globulin

might be used in the formation of milk protein and antibodies (Vihan and Rai, 1983). In addition, Nazifi *et al*. (2002) reported that lactation resulted in a significant decrease in serum lipids and cholesterol concentrations of Iranian fat-tailed sheep.

In the Egyptian local sheep breeds there are great variations in the hematological and biochemical parameters; consequently, it is difficult to formulate a common metabolic profile test for these breeds. Furthermore, studies on the hematological and biochemical blood parameters during early lactation stage have not been adequately reported. So, the present study was initiated to study the effect of breed and parity on certain hematological and biochemical parameters during first week after lambing throughout six consecutive parities of Barki, Rahmani and their crossbred ewes.

MATERIALS AND METHODS

This study was carried out at the Department of Animal Production, Faculty of Agriculture, Alexandria University, Alexandria, Egypt. Experiments were carried out after the Departmental approval, and were done without any commercial profit purposes for the Authors or the Department. All procedures and experimental protocols were conducted in accordance with the "Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching" Federation of Animal Science Societies, 2010.

Animals and management:

The current study was conducted at the Agricultural Experimental Station (31° 20′ N, 30° E) on three local sheep breeds throughout six consecutive parities. A total of 108 ewes of Barki, Rahmani and their crossbred (36 ewes per each breed and six ewes per each parity within breed) weighing between 55 – 70 kg were used throughout this study. Animals were kept outdoors with shelter during the daytime and housed in semi-open barns at night. The ewes were fed roughage and concentrate supplement according to their body weight requirements (NRC, 2007). They were fed Egyptian clover (*Trifolium alexandrium*) in winter and spring, and chopped maize or hay in summer and autumn. In addition, ewes received 1 kg/head/day a commercial concentrate mixture that contained 65% total digestible nutrients (TDN) and 14% crude protein. Water was offered to the animals at all time. All ewes were free of any disease and were clinically normal with healthy appearance.

Blood collection and analyses:

Blood samples were collected from the jugular vein of each ewe in the morning before access to feed and water. Blood samples were collected on lambing day and then every other day during first week after lambing. Samples were immediately withheld into heparinized tubes for hemoglobin (Hb) and packed cell volume PCV (%) determination according to conventional methods (Hepler, 1966). Mean corpuscular hemoglobin concentration (MCHC) was calculated and expressed as g/dl (%). Non-heparinized blood samples were centrifuged at 3000 rpm for 20 min and serum was harvested and stored at -20°C for later analyses. Serum total protein was measured by the Biuret method as described by (Armstrong and Carr, 1964) and albumin concentration was determined by the method of Doumas *et al*. (1977). Serum glucose concentration was assessed according to the method described by Trinder (1969). Serum total lipid was determined as described by Frings *et al*. (1972) and total cholesterol concentration was determined by a colorimetric method (Watson, 1960). Transaminase activities (AST and ALT) were measured by colorimetric methods described by Reitaman and Frankel (1957). Globulin concentration was calculated as the difference between serum total protein and albumin.

Statistical analyses

Data were analyzed using general linear model (GLM) procedure (SAS, 2002). Duncan's Multiple Range Test at ($p < 0.05$) was used to detect any variations between means to study the effect of breed, parity, days after parturition and their interaction on blood hematological and biochemical parameters,.

RESULTS

Data on the effect of sheep breeds on the overall mean hemoglobin (Hb, gm/dL) concentration, percentage of packed cell volume (PCV, %) and mean corpuscular hemoglobin concentration (MCHC, %) during the first week after lambing throughout six consecutive parities are presented in Table 1. Rahmani and crossbred ewes had higher ($p < 0.05$) Hb concentration compared to Barki ewes. Values of PCV % differed ($p < 0.05$) among all sheep breeds where Rahmani ewes had the highest values, and Barki ewes had the lowest values. On the other hand, the Barki x Rahmani crossbred ewes had greater ($p < 0.05$) MCHC than the other two ewe breeds. Data on the effect of parity on these parameters during the first week after lambing are shown in Table 2. Hemoglobin concentrations were increased ($P < 0.05$) in the ewes during the third and fifth parities than those during other parities. PCV and MCHC % fluctuated where the highest values were recorded in ewes at the fifth and third parities, respectively. There were interaction effects due to breed and parity on these hematological parameters. Barki ewes had lower ($P < 0.05$) Hb concentration in all parities than the other two breeds. On the other hand, Rahmani ewes had greater ($P < 0.05$) PCV than Barki ewes, while there were no significant differences between Rahmani and crossbred ewes during the first, third and fourth parities. The crossbred ewes showed higher ($P < 0.05$) MCHC % than the other two pure breeds in all parities except the sixth parity.

Data on the effect of sheep breeds on some serum biochemical constituents during the first week after lambing through six consecutive parities are presented in Table 3. Rahmani ewes showed greater ($P < 0.05$) serum total protein and albumin concentrations than both

Barki and crossbred ewes, while there were no significant differences among all breeds in globulin concentration. Serum total lipids and cholesterol concentrations were higher (P<0.05) in Barki ewes compared with those of Rahmani and crossbred ewes. Furthermore, Rahmani ewes had lower (P<0.05) serum total lipid concentrations than crossbred ewes. Moreover, crossbred ewes showed higher (P<0.05) serum glucose, AST and ALT activities than the two pure breeds, while Rahmani ewes had lower (P< 0.05) serum AST and ALT activities than Barki ewes.

Data on the effect of parity on some biochemical parameters during the first week after lambing of sheep is presented in Table 4. Serum total protein concentrations decreased (P< 0.05) in ewes during both the second and third parities. Rahmani ewes exhibited higher (P< 0.05) serum total protein than Barki ewes in all parities except the second, fourth and sixth parities. Overall mean serum albumin and globulin concentrations exhibited the maximum level in ewes during the third and fourth parities, respectively. Moreover, serum albumin and globulin concentrations fluctuated during different parities between breeds without increasing or decreasing general trend. There were no significant differences in the overall serum glucose concentrations throughout all parities. Serum total lipids and cholesterol concentrations fluctuated with the highest values of these parameters were noted during the sixth and third parities, respectively. Rahmani ewes showed lower (P<0.05) serum total lipid concentrations in all parities except during the third and fifth parities. Serum cholesterol concentrations were higher in Barki ewes compared with those of Rahmani and crossbred ewes throughout most parities (Table 3). On the other hand, AST activity was higher (P<0.05) in ewes at the first and third parities than those recorded at other parities, while ALT activity recoded higher (P<0.05) values at the third parity (Table 4). Moreover, crossbred ewes showed higher (P<0.05) serum AST and ALT enzyme activities than those recorded for both Rahmani and Barki ewes throughout most parities (Table 3).

In general, serum glucose concentrations were higher (P<0.05) during the first day after lambing than in other days studied (Figure 1). Moreover, within the first day after lambing, ewes in the sixth parity had greater (P<0.05) serum glucose concentration than ewes in the other five parities. Also, the lowest serum glucose concentration was recorded in ewes during the first and third parities, while there were no significant differences in serum glucose concentration among all parities throughout the other days studied (Figure 2).

The interaction effects of breed, parity and day during the first week after lambing on serum glucose concentration are presented in Figure (3). Barki ewes had higher (P< 0.05) serum glucose concentration during the sixth parity than ewes during other parities. On the other hand, Rahmani ewes had greater (P<0.05) serum glucose concentration during the fifth parity than during other parities. Furthermore, Rahmani ewes in the first parity had lower (P<0.05) serum glucose concentration compared with the ewes in the other parities. The crossbred ewes showed higher (P<0.05) serum glucose concentration during the fourth and sixth parities compared with those of ewes during the first, second and third parities. The lowest serum glucose concentration was recorded in crossbred ewes throughout the third parity.

DISCUSSION

The present data indicated that during early lactation, Rahmani and crossbred ewes had higher (P<0.05) Hb concentration and PCV% compared to Barki ewes. Usually, there is a small decrease in Hb concentration immediately after parturition, which could be due to the over-production of epinephrine in response to the stress of parturition process (Mohy *et al*., 1985). On the other hand, crossbred ewes had greater (P<0.05) MCHC than the other two pure breeds, which disagrees with the findings of Hassan *et al*. (1982) on cross-bred cows (Egyptian X Holstein) and buffalo cows. Present results also showed that the overall mean hemoglobin concentrations were high in ewes at the third and fifth parities during which milk yield might be high. These results are not consistent with the findings of Hassan *et al*. (1982) who reported that lactating animals had low PCV % and Hb concentration during the second and third parities during which milk yield was high, suggesting a significant negative correlation coefficient between PCV% and lactation.

Studies by Youatt *et al*. (1965) noted less variation in mean hemoglobin concentration from 15.0 gm at 1 day postpartum to 16.5 gm at 3 day postpartum in nursing white-tailed does. However, Parra *et al*. (1999) demonstrated that the proportion of dual-propose cows with anemia (PCV<27%) increased from 28% before calving to 63% after two-three months of lactation. Also, the PCV% significantly decreased during the postpartum period compared to pregnancy and before pregnancy in Holstein cattle and Baladi goats as reported by Chaiyabutr *et al*. (1998) and Azab and Abel-Maksoud (1999),

respectively. Furthermore, El-Sherif and Assad (2001) noted a sharp decline in PCV% during the first month postpartum in Barki ewes to become lower than that of dry ones. These low values may indicate a high erythrocyte destruction by the active mammary glands of lactating animals, low hemoglobin synthesis and/or increasing water mobilization of mammary gland through the vascular system (Hassan *et al.*, 1982 and El-Sherif and Assand, 2001).

The present results also noted significant differences in almost biochemical parameters among the different breeds, while there were no significant differences among early postpartum days (data not shown). However, these results disagree with the findings in Barki ewes, which revealed that blood proteins decreased during late pregnancy and gradually increased to the reference value during lactation (El-Sherif and Assad, 2001). Furthermore, total protein was decreased at parturition (Vihan and Rai, 1983). These changes in plasma proteins might represent an adaptive response to higher need of water mobilization and protein by blood to mammary glands for milk synthesis.

The data of the current study indicated that serum total protein concentrations were lower in ewes during the second and third parities than in the older ones. Rahmani ewes had higher serum total protein than the other two breeds, while albumin and globulin levels fluctuated in the same breed through different parities. The present data are partially consistent with the findings of Roubies *et al.* (2006) who found that mean concentrations of total protein, albumin and globulin were affected by age, and they were lower in ewe lambs than in older ewes. However, Kessabi and Lamnaouer (1981) reported that total protein increased with age, which was attributed to an increase in globulin fractions. In contrast, it was shown in Karakul sheep that animals aged less than one year had significantly higher serum albumin than the older ones, while the serum total protein level was not affected by age (Baumgartner and Pernthaner, 1994). Moreover, Alonso *et al.* (1997) demonstrated in Merino sheep a negative relationship between age and serum total protein, where serum total protein decreased with the increase in age. The variety of the results about the effect of age on these parameters may be explained by the effect of breed and rearing conditions (Roubies *et al.*, 2006).

The current results showed that serum total lipids and cholesterol concentrations fluctuated where the highest values of these parameters were noted at the sixth and third parities, respectively. Rahmani ewes showed lower serum total lipids concentration in most parities than in the other two breeds. The decreasing pattern of serum triglycerides and cholesterol in early lactation was previously reported in dairy cows which showed the lowest values of these compounds at the onset of lactation for their growing requirement for energy (Marcos *et al.*, 1990). The present results are consistent with our unpublished data which showed that Rahmani ewes had more milk yield than Barki ewes. This is also in accordance with other authors who observed the lowest cholesterol and triglyceride concentration at 2–3 weeks postpartum (Nazifi *et al.*, 2002). In addition, Zumbo *et al.* (2007) found that cholesterol and triglyceride concentrations decreased significantly after foaling due to increased lipoprotein lipase activity. Similarly, a gradual increase in serum cholesterol and triglyceride levels was noted during pregnancy when compared to day 45 postpartum in Akkaraman ewes (Bahkci *et al.*, 2007). Furthermore, serum cholesterol of Ardy goats was found to be low at the first postpartum day (Amer *et al.*, 1999).

However, the adipose tissue metabolism is strictly related to insulin, which stimulates lipogenesis in pregnant ewes, while lactating individuals show a significant decrease in its serum compounds. During lactation the insulin stimulation of lipogenesis may become inefficient which is confirmed by the significant decrease in serum triglycerides and total cholesterol at post-partum period compared to early pregnancy (Piccione *et al.*, 2009).

The present data showed that serum glucose concentration was higher at the first day after lambing than during the other three days. Within the first day after lambing, ewes in the sixth parity had greater serum glucose concentration than ewes in the other five parities. These results are in quite agreement with the findings of Vihan and Rai (1983) and El-Sherif and Assad (2001), who reported that blood glucose of pregnant ewes started to increase from the beginning of pregnancy and continued increasing to reach the peak at parturition. Moreover, the peak of plasma glucose levels was observed on the last day of pregnancy in dairy sheep (Charismiadou *et al.*, 2000). Schlumbohm *et al.* (1997) previously stated that insulin responsiveness was significantly reduced in sheep during late pregnancy and parturition, which led to decrease glucose turnover and uptake by muscle and fat tissues. In spite of, the high need for glucose under stress such as pregnancy and parturition, the output of adrenocorticotrophic hormone, glucocorticoids and epinephrine is increased for the breakdown of liver glycogen (Bell *et al.*, 1961).

Previous studies showed an inverse relationship between serum glucose and milk lactose especially in the 2nd, 3rd, 7th and 14th days postpartum in Ardy goats, which can be attributed to the fact that milk lactose is formed from blood glucose (Amer *et al.*, 1999). Furthermore, the authors reported that on the 2nd and 3rd days postpartum, conversion of glucose into lactose occurs to a large extent during the colostrum secretion reflecting the dynamic activity of the animals at this stage. Also, it has been found that serum glucose level was not affected by time period and physiological status of the goats (Van den Top *et al.*, 1995).

CONCLUSIONS

The results obtained in this study showed high overall mean concentrations of Hb, PCV%, serum total protein and albumin in Rahmani ewes during the first week after parturition throughout six consecutive parities compared to Barki ewes at the same breeding conditions. On the other hand, the Barki ewes had higher cholesterol and triglyceride concentrations than those of Rahmani ewes. Serum glucose concentration was higher at the first day after lambing than during the other three days. Within the first day after lambing, ewes in the sixth parity had greater serum glucose concentration than ewes in the other five parities. These results may be reflected on the productivity and adaptability of each breed to their environment.

REFERENCES

Alonso, A.J., R. De Teresa, M. Garcia, J.R. Gonzalez and M. Vallejo, 1997. The effects of age and reproductive status on serum and blood parameters in Merino breed sheep. J. Vet. Med. A 44: 223 – 231.

Amer, H.A., H.A.H. Salem and A.A. Al-Hozab, 1999. Biochemical changes in serum and milk constituents during postpartum period in Saudi Ardy goats. Small Rumin. Res. 34: 167 – 173.

Armstrong, W.D. and C.W. Carr, 1964. Physiological Chemistry Laboratory Directions. Third ed. Burges Publishing Co. Minn, Minnesota.

Azab, M.E. and H.A. Abdel-Maksoud, 1999. Changes in some hematological and biochemical parameters during prepartum and postpartum periods in female Baladi goats. Small Rumin. Res. 34: 77 – 85.

Bahkci, E., A. Yildiz and F. Gurdogan, 2007. Blood metabolite concentrations during pregnancy and postpartum in Akkaraman ewes. Small Rumin. Res. 67: 247 – 251.

Baumgartner, W. and A. Pernthaner, 1994. Influence of age, season and pregnancy upon blood parameters in Austrian Karakul sheep. Small Rumin. Res. 13: 147 – 151.

Bell, G.H., J.H. Davson and H. Scarborough, 1961. Textbook of Physiology and Biochemistry, fifth ed. Neil & Co. Ltd., Edinburgh, UK, pp. 291–313, 988–1026.

Chaiyabutr, N., S. Komolvanich, S. Sawangkoon, S. Preuksagorn and S. Chanpongsang, 1998. Glucose metabolism in vivo in crossbred Holstein cattle feeding on different types of roughage during late pregnancy and early lactation. Comparative Biochem. and Physiol. Part A 119: 905 – 913.

Charismiadou, M.A., J.A. Bizelis and E. Rogdakis, 2000. Metabolic changes during the perinatal period in dairy sheep in relation to level of nutrition and breed. I. Late pregnancy. J. Anim. Phys. Anim. Nutr. 84: 61–72.

Doumas, B.T., W.A. Wastson and H.G. Biggs, 1977. Albumin standards and measurements of serum albumin with bromocresol green. Clin. Chem. Acta. 31: 87 – 96.

El-Sherif, M.M.A. and F. Assad, 2001. Changes in some blood constituents of Barki ewes during pregnancy and lactation under semi arid conditions. Small Rumin. Res. 40: 269 – 277.

Frings, C.S., T.W. Fendly, R.T. Dunn and C.A. Queen, 1972. Improved determination of total serum lipids by the sulfo-phosophovanillin veaction. Clin. Chem. 18: 673 – 674.

Hassan, A., N. Al-Akkam and M. Samak, 1982. Effects of various lactational events and stage of pregnancy on lactational trends, plasma hydrocortisone and blood haematology of cross-bred (Egyptian X Holstein) and buffalo (*Bubalus bubalis*) cows. World Rev. of Anim. Prod. 18: 71 – 79.

Hepler, O.E., 1966. Manual of Clinical Laboratory Methods. Thomas, Sprongfield, Illinois, USA.

Kessabi, M. and D. Lamnaouer, 1981. Serum proteins and their fractions in Timahdite sheep in Morocco: Variations with age and liver or lung diseases. Ann. Rech. Vet. 12: 233 – 237.

Marcos, E., A. Mazur, P. Cardot and Y. Rayssiguier, 1990. The effect of pregnancy and lactation on serum lipid and apolipoprotein B and A-I levels in dairy cows. J. Anim. Physiol. Nutr. 64: 133 – 138.

Mohy, A.D.M., Z.A. Abo-Elezz, M. Samak and A. Hassan, 1985. Variations in

haematological of cross-bred goats (Baladi X Angora) during pregnancy, lactation and dry seasons. World Rev. of Anim. Prod. 21: 39 – 43.

Nazifi, S., M. Saeb and S.M. Ghavami, 2002. Serum lipid profile in Iranian fat-tailed sheep on late pregnancy at parturition and during post-partuition period. J. Vet. Med. 49: 9 – 12.

NRC., 2007. Nutrient Requirements of Small Ruminants. National Academy of Sciences, Washington, D.C., USA.

Parra, O., A. Ojeda, J. Combellas, L. Gabaldon, A. Escobar, N. Martinez and M. Benezra, 1999. Blood metabolites and their relationship with production variables in dual-purpose cows in Venezuela. Preventive Vet. Med. 38: 133 – 145.

Piccione, G., G. Caola, C. Giannetto, F. Grasso, S.C. Runzo, A. Zumbo and P. Pennisi, 2009. Selected biochemical serum parameters in ewes during pregnancy, post-parturition, lactation and dry period. Amin. Sci. Papers and Reports 27: 321 – 330.

Reitman, S. and S. Franckel, 1957. A colorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminase. Amer. J. Clin. Pathol. 28: 56 – 63.

Roubies, N., N. Panousis, A. Fytianou, P.D. Katsoulos, N. Giadinis and H. Karatzias, 2006. Effects of age and reproductive stage on certain serum biochemical parameters of Chios sheep under Greek rearing conditions. J. Vet. Med. A 53: 277 – 281.

SAS., 2002. SAS User's Guide: Statistical Analysis System Institute, Inc., Cary, NC. USA.

Schlumbohm, C., H.P. Sporleder, H. Gurtler, and J. Harmeyer, 1997. The influence of insulin on metabolism of glucose, free fatty acids and glycerol in normo- and hypocalcaemic ewes during different reproductive states. Deutsch. Tieraerztl. Wochenschr. 104: 359- 365.

Takarkheade, R.C., V.C. Gondane, A.Y. Kolte and D.H. Rekhate, 1999. Biochemical profile during different phases of reproduction en ewes in comparison to rams. Indian Vet. J. 76: 205- 207.

Trinder, P., 1969. Determination of glucose in blood using glucose oxidase with alternative oxygen acceptor. Annals Clinical Biochemistry 6: 24 – 27.

Van den Top, A.M., A.T. Van't Klooster, T. Wensing, G.H. Wentink and A.C. Beynen, 1995. Liver triacylglycerol concentrations around parturition in goats with either pre-partum restricted or free access to feed. The Vet. Quarterly 17: 54-59.

Vihan, V.S. and P. Rai, 1983. Metabolic profiles at different physiological stages in sheep and goat. Indian J. Vet. Med. 3: 1–8.

Watson, D., 1960. A simple method for determination of serum cholesterol. Clin. Chem. Acta. 5: 637 – 638.

Youatt, W.G., L.J. Verme and D.E. Ullrey, 1965. Composition of milk and blood in nursing white-tailed does and blood composition of their fawns. J. of Wildlife Management 29: 79 – 84.

Zumbo, A., A.R. Di Rosa, S. Casella and G. Piccione, 2007. Changes in some blood haematochemical parameters of Maltese goats during lactation. J. of Anim. and Vet. Adv. 6: 706 – 711.

Table 1. Effect of breed on the overall mean hemoglobin (Hb), packed cell volume (PCV) and mean corpuscular hemoglobin concentration (MCHC) during the first week after lambing throughout six consecutive parities in sheep (mean±SE)

Parameters	Breed		
	Barki	Rahmni	Barki × Rahmani
Hb (g/dL)	9.79 ± 0.08^b	11.22 ± 0.09^a	11.01 ± 0.08^a
PCV (%)	27.37 ± 0.27^c	31.32 ± 0.28^a	28.94 ± 0.24^b
MCHC (%)	35.94 ± 0.25^b	36.01 ± 0.24^b	38.21 ± 0.24^a

[a-c] Means within rows with different superscript letters differ significantly ($P < 0.05$).

Table 2. Effect of parity on the overall mean hemoglobin (Hb), packed cell volume (PCV) and mean corpuscular hemoglobin concentration (MCHC) during the first week after lambing throughout six consecutive parities of sheep (mean±SE)

Parameters	Parity					
	1	2	3	4	5	6
Hb (g/dL)	10.41 ± 0.13^{bc}	10.34 ± 0.13^c	11.05 ± 0.13^a	10.74 ± 0.13^{ab}	11.02 ± 0.15^a	10.48 ± 0.15^{bc}
PCV (%)	$29.21\pm.041^{ab}$	28.42 ± 0.35^b	29.47 ± 0.37^{ab}	29.02 ± 0.36^b	30.25 ± 0.52^a	28.82 ± 0.47^b
MCHC (%)	35.83 ± 0.39^c	36.50 ± 0.35^{bc}	37.61 ± 0.30^a	37.04 ± 0.34^{ab}	36.70 ± 0.28^{abc}	36.62 ± 0.46^{abc}

[a-c] Means within rows with different superscript letters differ significantly ($P < 0.05$).

Table 3. Effect of breed on some serum biochemical constituents during the first week after lambing in six consecutive parities of sheep (mean±SE)

Parameters	Breeds		
	Barki	Rahmani	Barki × Rahmani
Total protein (g/dL)	7.00 ± 0.11^{b}	7.38 ± 0.08^{a}	7.13 ± 0.06^{b}
Albumin (g/dL)	4.13 ± 0.03^{b}	4.44 ± 0.07^{a}	4.12 ± 0.03^{b}
Globulin (g/dL)	2.93 ± 0.09	2.94 ± 0.08	3.01 ± 0.03
Glucose (mg/dL)	45.00 ± 1.30^{b}	44.15 ± 1.28^{b}	48.01 ± 1.21^{a}
Total lipids (mg/dL)	351.11 ± 5.02^{a}	308.55 ± 5.05^{c}	324.77 ± 4.91^{b}
Cholesterol (mg/dL)	71.17 ± 1.36^{a}	66.12 ± 1.10^{b}	64.76 ± 1.39^{b}
AST (U/ml)	69.24 ± 1.13^{b}	57.88 ± 1.00^{c}	75.11 ± 0.51^{a}
ALT (U/ml)	27.92 ± 0.51^{b}	22.90 ± 0.44^{c}	31.63 ± 0.26^{a}

$^{a-c}$ Means within rows with different superscript letters differ significantly ($P < 0.05$).

Table 4. Effect of parity on some serum biochemical constituents during the first week after lambing in six consecutive parities of sheep (means±SE)

Parameters	Parities					
	1	2	3	4	5	6
Total protein (g/dL)	7.25 ± 0.12^{a}	6.76 ± 0.08^{b}	6.80 ± 0.12^{b}	7.54 ± 0.16^{a}	7.35 ± 0.10^{a}	7.31 ± 0.12^{a}
Albumin (g/dL)	4.20 ± 0.05^{b}	4.01 ± 0.04^{c}	4.59 ± 0.11^{a}	4.15 ± 0.05^{bc}	4.25 ± 0.06^{b}	4.19 ± 0.05^{b}
Globulin (g/dL)	3.05 ± 0.09^{b}	2.75 ± 0.06^{c}	2.30 ± 0.09^{d}	3.40 ± 0.16^{a}	3.12 ± 0.09^{ab}	3.13 ± 0.11^{ab}
Glucose (mg/dL)	44.27 ± 1.51	44.56 ± 1.32	45.43 ± 1.55	45.79 ± 1.57	45.92 ± 2.15	48.34 ± 2.45
Total lipids (mg/dL)	341.10 ± 8.41^{a}	317.97 ± 7.32^{b}	329.99 ± 6.48^{ab}	295.00 ± 6.96^{bc}	337.06 ± 5.55^{ab}	346.76 ± 7.57^{a}
Cholesterol (mg/dL)	62.74 ± 1.65^{d}	65.31 ± 2.04^{bcd}	75.27 ± 2.00^{a}	68.31 ± 1.96^{b}	68.92 ± 1.61^{b}	63.54 ± 1.39^{cd}
AST (U/ml)	73.40 ± 1.02^{a}	63.51 ± 1.62^{c}	72.60 ± 1.26^{a}	62.96 ± 1.70^{c}	62.96 ± 1.70^{c}	65.17 ± 1.26^{bc}
ALT (U/ml)	29.36 ± 0.51^{b}	25.10 ± 0.91^{d}	31.04 ± 0.47^{a}	27.40 ± 0.49^{c}	27.40 ± 0.49^{c}	24.90 ± 0.55^{d}

$^{a-d}$ Means within rows with different superscript letters differ significantly ($P < 0.05$).
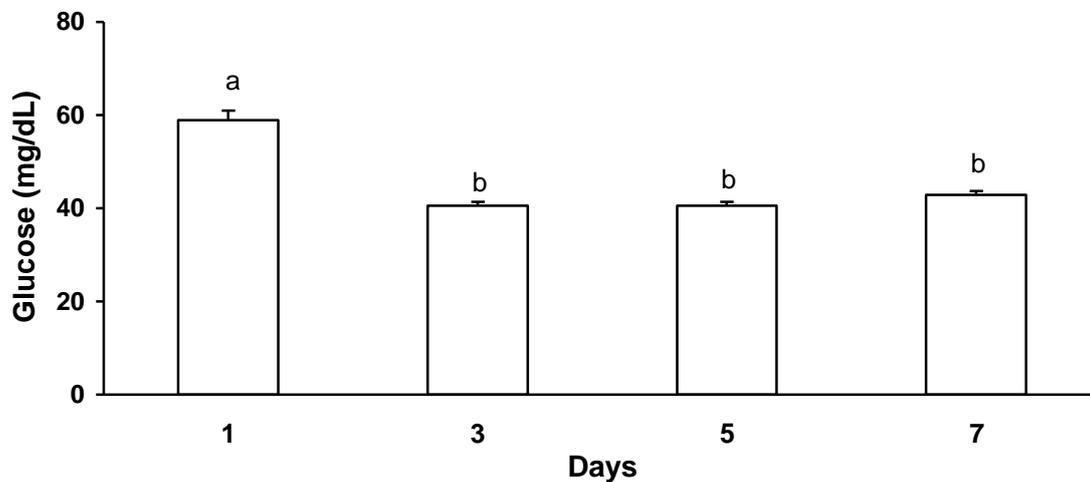

Figure 1. Effect of day during the first week after lambing on blood serum concentration of glucose (mg/dL) throughout six consecutive parities of sheep. ^{a,b} means with different superscript letters differ significantly ($P < 0.05$).
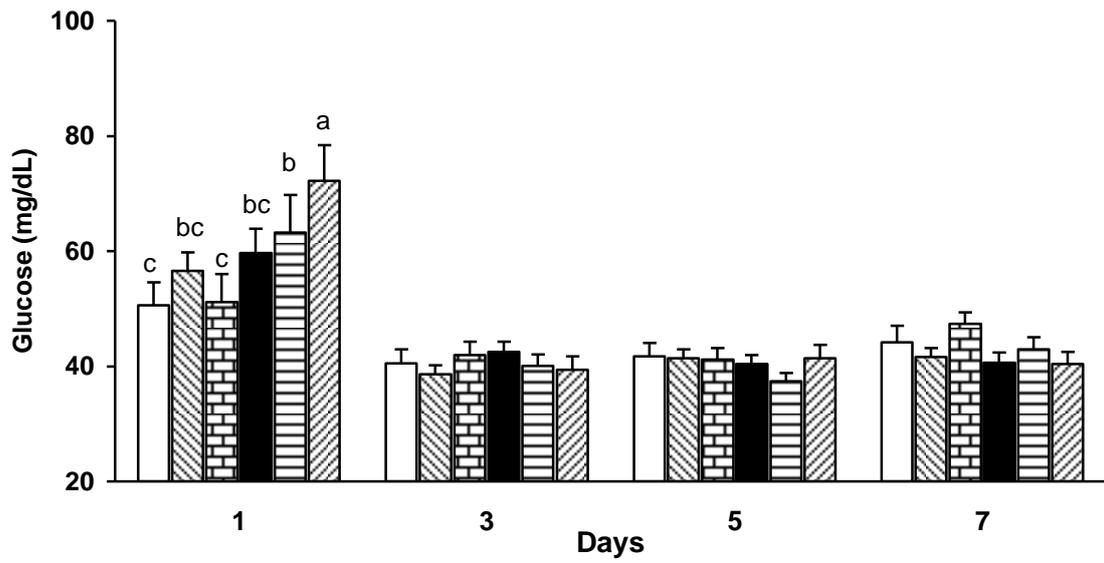
Figure 2. Changes in blood serum concentration of glucose (mg/dL) during the first week after lambing throughout six consecutive parities [parity 1 (☐), parity 2 (▨), parity 3 (▤), parity 4 (■), parity 5 (▤) and parity 6 (▨)] of sheep. [a-c] means within the same parity with different superscript letters differ significantly (P < 0.05).
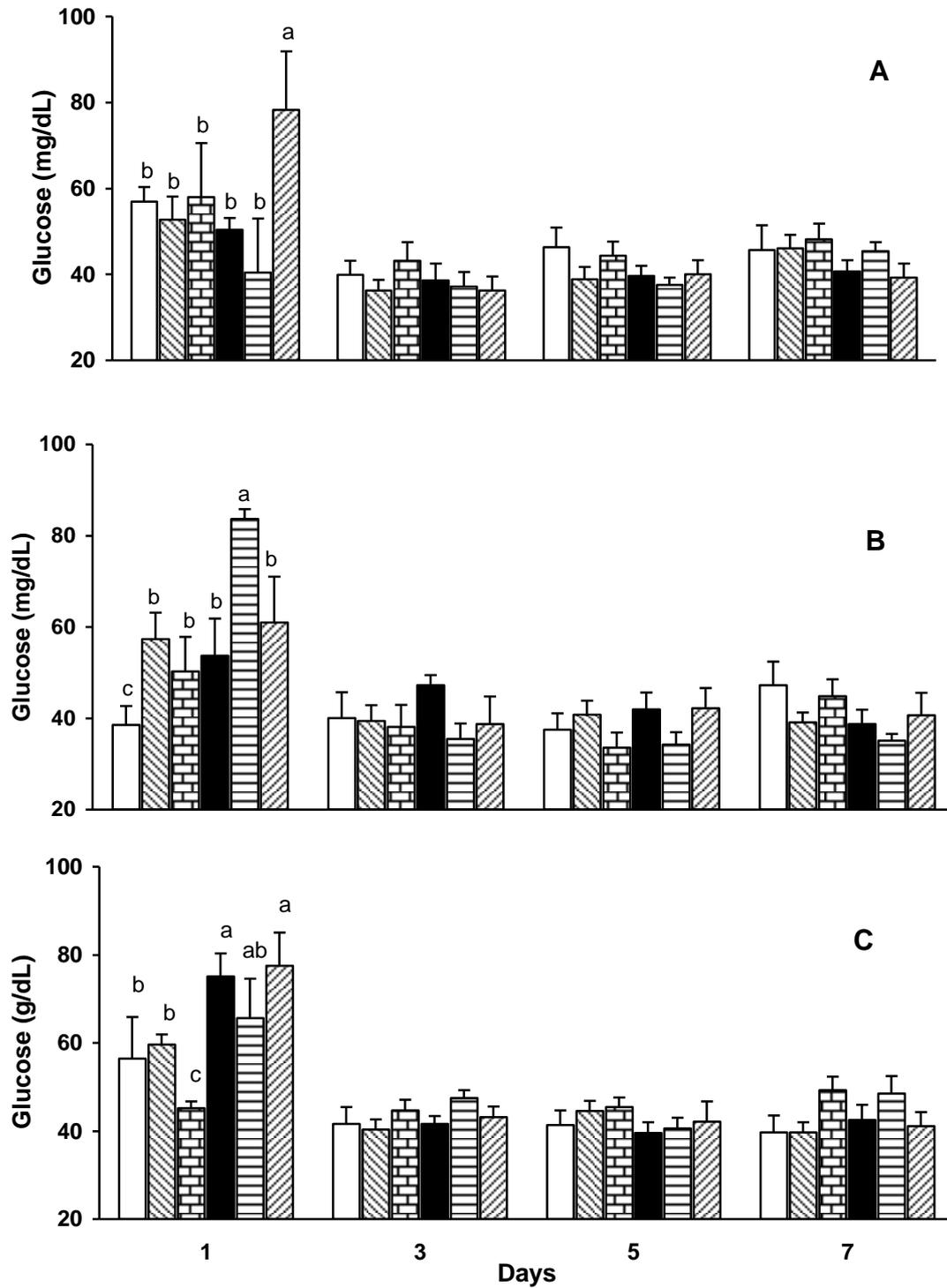
Figure 3. Effect of day during the first week after lambing on blood serum concentration of glucose (mg/dL) in Barki (A), Rahmani (B) and their crossbred (C) ewes throughout six consecutive parities [parity 1 (☐), parity 2 (▨), parity 3 (⊞), parity 4 (■), parity 5 (☐) and parity 6 (▨)]. [a-c] means within the same parity with different superscript letters differ significantly (P < 0.05).

التغيرات في بعض المعايير الهيماتولوجية والبيوكيميائية خلال الإسبوع الأول بعد الولادة في ستة مواسم متتالية لبعض سلالات الأغنام المصرية

محمد محمد أنور¹، عادل نورالدين محمد نورالدين²، طه أحمد طه²

1 ـ معهد بحوث الإنتاج الحيوانى، مركز البحوث الزراعية، وزارة الزراعة، القاهرة، 2 ـ قسم الإنتاج الحيوانى، كلية الزراعة، جامعة الإسكندرية، الإسكندرية

أجريت هذه الدراسة في محطة البحوث بقسم الإنتاج الحيواني- كلية الزراعة- جامعة الإسكندرية- بهدف معرفة تاثير كلاً من السلالة و موسم الولادة على بعض المعايير الهيماتولوجية والبيوكيميائية أثناء الإسبوع الأول من موسم الحليب خلال ستة مواسم متتالية لبعض سلالات الأغنام المصرية ، وفي هذه الدراسة تم إستخدام عدد 108 نعجة من ثلاث سلالات هي الرحماني و البرقي و خليطهما (36 نعجة لكل سلالة) بحيث كانت هناك 6 نعاج /موسم/سلالة، وعينات الدم تم تجميعها من الوريد الودجي لكل الحيوانات يوم بعد يوم خلال الإسبوع الأول من موسم الحليب ، وأوضحت النتائج زيادة تركيز الهيموجلوبين في دم نعاج الرحماني والخليط وذلك بالمقارنة بنعاج البرقي وأن هناك إختلافات معنوية (P<0.05) بين السلالات في قيمة الـ PCV حيث أن نعاج الرحماني أظهرت أعلى قيمة للـ PCV بينما نعـاج البرقي أظهرت أقل قيمة ، قيمة الـ MCHC كانت مرتفعة معنوياً في النعاج الخليط بالمقارنة بنعاج السلالات النقية (البرقي و الرحماني) ، وبالنسبة لتأثير الموسم على المقاييس الهيماتولوجية فإن الهيموجلوبين كان مرتفع معنوياً (P<0.05) في دم النعاج التي في المواسم الثالث والخامس بالمقارنة بباقي المواسم موضع الدراسة بينما تذبذبت قيم كلاً من الـ PCV و MCHC في المواسم المختلفة مع ملاحظة أن أعلى قيم لهما سجلت في الموسم الخامس والثالث على الترتيب. وبالنسبة للمعايير البيوكيميائية فإن سيرم دم النعاج الرحماني احتوى على تركيز مرتفع (P<0.05) من البروتين الكلي والألبيومين وذلك بالمقارنة بسيرم دم نعاج البرقي والخليط بينما سيرم دم النعاج البرقي احتوى على تركيز عالي (P<0.05) من الكوليستيرول والدهون الكلية بالمقارنة بسيرم نعاج الرحماني والخليط. والنعاج الخليط أظهرت زيادة في تركيز الجلوكوز و نشاط إنزيمات الـ AST و ALT بالمقارنة بالنعاج في السلالات النقية (البرقي و الرحماني). وعلى الجانب الآخر فإن النعاج التي بالموسم الثالث أظهرت زيادة في تركيز الألبيومين و الكوليستيرول و الـ AST و ALT عن النعاج التي في المواسم الأخرى ، والنعاج التي في المواسم الثاني والثالث أظهرت إنخفاضاً في تركيز البروتين الكلي بالسيرم. تركيز الجلوكوز كان مرتفع في اليوم الأول من موسم الحليب ثم حدث فيه إنخفاض حاد بداية من اليوم الثالث من موسم الحليب ، وخلال اليوم الأول من موسم الحليب فإن النعاج التي في الموسم الأول أظهرت إنخفاضاً في تركيز الجلوكوز والذي بدأ في الزيادة مع زيادة عدد مواسم الولادة وذلك في السلالات الثلاث موضع الدراسة. وبالتالي فإن نتائج هذه الدراسة توضح أن نعاج الرحماني والخليط أظهرت زيادة في تركيز الهيموجلوبين والـ PCV بالمقارنة بنعاج البرقي وذلك ربما ينعكس على المقدرة الإنتاجية والتأقلمية لكل سلالة لبيئتها.