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CHANGES IN CERTAIN BLOOD AND MILK CONSTITUENTS DURING THE FIRST 5 WEEKS POST-LAMBING IN COARSE-WOOL EWES OF UPPER EGYPT

(With 2 Tables & 4 Figures)

By

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(Received at 13/5/1993)

التغيرات في بعض مكونات الدم واللبن أثناء الأسابيع الخمس الأولى بعد الولاده في نعاج الصوف الخشن في صعيد مصر

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اجريت هذه الدراسه على عدد ١٠ من نعاج الصوف الخشن لدراسة التغيرات فى بعض مكونات الدم واللبن وأيضاً عدد الخلايا الجسميه ، خلال الخمس أسابيع الأولى بعد الولاده . المتوسط العام لنسب كل من بروتين اللبن ، الدهن ، اللاكتوز والكلوريد كان على التوالى ٦١ ر ٥ ، ٣٧٠ ر ٧ ، ٤٥ ر ٤ ، ٠٨٠ ر ٪. أثناء الأسبوع الأول من الولاده لوحظ أرتفاع ملحوظ فى نسب كل من بروتين اللبن ، الدهن وكذلك الكلوريد بالمقارنه بالاسابيع الأخرى . الأسبوع الثانى من الولاده أرتفع مستوى لاكتوز اللبن إلى أعلى معدل (٨ ر ٥٪) بينما أنخفض إلى أدنى مستوى له فى الأسبوع الخامس (٥ ر ٣٪). المتوسط العام لعدد الخلايا الجسميه فى اللبن كان ٠٤٤ ر ٧٠٩ ألف / مل لبن. وقد لوحظ أن أعلى معدل فى الأرتفاع كان فى السبوع الخامس بعد الولاده مصحوباً بأنخفاض ملحوظ فى نسبة سكر اللبن (اللاكتوز). خلال فترة التجربه تغيرت معنوياً نسب كل من البروتين الكلى ، االكولستيرول وكذلك نتروجين اليوريا فى سيرم الدم. أثناء الأسبوع الخامس من الولاده أرتفع نسبة سيرم الجلوبيولين معنوياً مما قد يدل على أرتفاع معدل تخليق الجلوبيولينات المناعيه فى هذه الفتره. لم تتغير نسب كل من الجلوكوز والالبيومين فى سيرم الدم معنوياً .

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SUMMARY

Ten coarse-wool Saidi ewes of Upper Egypt were utilized to study changes in certain blood and milk constituents and somatic cell counts during the first 5 weeks post-lambing. The overall means of milk protein, fat, lactose, chloride percentages were 5.61, 7.37, 4.45 and 0.08 respectively. Milk protein, fat and chloride percentages were higher during the 1st wk of lactation compared with other weeks. A significant positive correlation (r = + 0.5, P< 0.01) was obtained between milk protein and fat percentages. Lactose percentage reached the highest level during the 2nd wk (5.8%) and the lowest level during the 5th wk (3.5% , P < 0.05). The overall mean of somatic cell counts was 709.044 X 10^3 cell/ml. The high somatic cell count was observed at wk 5 of lactation and coincided with the lowest level of lactose. Significant changes (P< 0.05) occurred in serum total protein, cholesterol, and urea N through lactation weeks. Serum globulin was highest (P< 0.07) during the 5th wk (4.18 g/dl) which indicate increased rate of immunoglobulin biosynthesis. Changes in serum glucose and albumin were not significant.
(Keywords: Milk, blood, lactation, sheep, ewe).

INTRODUCTION

Most studies on postpartum changes in milk composition and somatic cell count and the corresponding changes in serum metabolites have been confined to cattle. No complete data exist for the Egyptian ewes. The objective of this study was to determine postpartum changes in milk composition and somatic cell counts in retation to changes in selected serum constituents.

MATERIAL and METHODS

This trail was carried out in the Experimental Farm of the Department of Animal Production. Ten coarse-wool Saidi ewes of Upper Egypt were used after lambing. All animals received 1.5 kg daily of a pelleted concentrate diet prepared commercially and consisted of wheat bran (40.5%), cotton seed meal (10%),

soybean meal (2%), molasses (9%), corn (12%), rice hulls (7.5%), flax straw (14%), limestone (3.5%) and mineralized salt (1.5%) on dry matter (D.M.) basis. Milk and blood samples were obtained from ewes at 0900 at wk 1,2,3 and 5 post-lambing. Blood samples were collected by jugular venipuncture using a clean dry plastic syringe and then transferred to centrifuge tubes and allowed to clot at room temperature. Serum was then separated by centrifugation at 3000 rpm from 15 min. Serum was subsequently decanted into glass vials and stored at -20 C until it was analyzed. Serum glucose, cholesterol and albumin were analyzed using kits supplied by BioMeriex, France; serum total protein was analyzed using a kit supplied by Bio-Analytics, Florida, U.S.A. and serum globulin was claculated mathematically by difference. Serum urea N was estimated using assay kits of Diamond Diagnostic, Egypt. Milk samples were immediately used to determine percentages of total milk protein by Kjeldahl's methods (*OGG et al., 1948*), fat by Gerber method (*APHA, 1978*), lactose by Benedict method (*HARVEY and HILL, 1967*), chloride (*LING, 1963*). Somatic cell counts (Scc) were determined as described by *ROUSHDY et al. (977)*. Data were analyzed using general linear model (GLM) procedure described in *SAS (1987)* for personal computers. Serum and milk constituents and somatic cell counts were analyzed by split-plot analysis of variance for repeated measures (*GILL and HAFS, 1971*).

RESULTS

Milk constituents:

Changes of milk total protein, fat and chloride percentages during the first 5 wk of lactation are presented in Table 1 and Figure 1.Milk total protein was relatively high during the 1st wk, then decreased by about 25% during the 2nd wk and slightly increased thereafter. Milk fat percentage also decreased by about 8% during the 2nd wk compared with the 1st wk and reached the lowest level at the sth wk (6.57%, $P<0.05$). Chloride percentage was relatively higher during the 1st wk compared with subsequent weeks. Significant changes ($P<0.05$) occurred in lactose percentages through lactation weeks (Table 1 and Fig. 1). Lactose % peaked at the 2ndwk, then continued to decrease to reach the lowest level at the 5th wk of lactation. Somatic cell counts (Table 1 and Fig. 2) remained almost constant during the 1st and 2nd wk of lactation, then increased by about 21% during the 3rd wk and about 72% ($P<0.05$) during the 5th wk compared with the 1st one.

Blood costituents: Changes in serum glucose concentrations through weeks of lactation were not significant (Table 2 and Fig. 3). However, serum glucose level tended to increase consistently through weeks of lactation. On the other hand, serum cholesterol level remained relatively constant during the first 15 d of lactation, then decreased by about 30% at the 3rd wk, to increase again to reach the highest level at the 5th wk (71.8 mg/dl, $P<0.07$). Significant changes ($P<0.05$) in serum total protein occurred during lactation weeks (Table 2 and Fig. 4). The lowest value was recorded at the 3rd wk (5.77 g/dl) and highest value was recorded at the 5th wk (8.32 g/dl). This trend was almost noticed for serum albumin and globulin levels (Table 2 and Fig. 4). Substantial changes ($P<0.05$) occurred in serum urea N concentrations through lactation weeks (Table 2 and Fig. 3). In contrast to serum cholesterol, total protein and globulin concentrations in which the lowest levels were recorded at 3rd wk, serum urea N level was highest at the 3rd week.

DISCUSSION

Means of milk constituents in the present study (Table 1) are within normal range reported by *BREMEL (1982)* and *JENNESS (1985)* in foreign breeds of sheep. But somatic cell counts in milk of Saidi ewes were above the normal values of 50,000 to 200,000 cells/ml milk of non-infacted cows. The higher percentages of milk protein and fat during the 1st wk of lactation compared with subsequent weeks were anticipated because of the increase in water secretion (associated with the increase in milk production) after the 1st wk of lactation. A significant positive correlation was obtained between milk protein and fat percentage ($r = + 0.50, P<0.01$). The increase in milk lactose percentage during the 2nd wk is unclear, but the decrease during the 5th wk could be due to increase somatic cell count during the 5th wk of lactation. *RENNER (1922),, GIESECKE and VAN DER HEEVER (1974) and GLABOWNA et al. (1989)* reported that reduced lactose values were related to udder infection or mastitis in cattle. Somatic cell counts are related to both milk yield and milk flow rate as well as intramammary pressure and accumulated end products in the cells *(HUCK, 1977; GUIDRY, 1985; DAGHASH, 1989*). In the present study, the increase in somatic cell counts at wk 3 and obviously at wk 5 ($P< 0.05$) of lactation, might be the result of increased intramammary pressure and accumulated end products in the cells (*HUCK, 1977; GUIDRY, 1985*; *WATERMAN and GOREWIT,*

1980). Means of serum constituents in the present study fall within normal range reported by *HALLFORD and GALYEAN (1982) and SHETAEWI and ROSS (1991)* in fine wool sheep. Although changes in serum glucose concentrations through weeks of lactation were not significant (Table 2), the highest level for serum glucose (wk 5) coincided with the lowest level of milk lactose (Table 1). This finding might be due to decreased rate of glucose uptake by mammary gland cells for biosynthesis of lactose *(COLLIER, 1985)*. The sharp decrease in serum cholesterol, together with serum total protein and globulin during the 3rd wk of lactation (Table 2 and Fig. 3 & 4) could be due to decreased availability of nutrients, increased rate of degradation. The increase in serum urea N concentration during the 3rd wk might indicated that degradation of protein was higher during that period. The reverse was true during the 5th wk (Table 2 and Fig. 3). Serum globulin (Table 2 and Fig. 4) reached the highest level at wk 5 of lactation ($P<0.07$), and was even higher than serum albumin (4.18vs 3.52, g/dl, respectively). Increased rate of immunoglobulin biosynthesis during that period might explain this observation.

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Table 1. Milk protein, fat, lactose, and somatic cell concentrations in Saidi ewes through weeks of lactation[a]

Item	Weeks of lactation				
	1	2	3	5	Overall
T. protein (%)	6.58 ± 1.15	4.94 ± .52	5.28 ± 1.28	5.75 ± 1.28	5.61 ± .26
Fat (%)	8.03[b] ± .41	7.37 ± .58	6.75 ± .58	6.57[c] ± .62	7.37 ± 1.64
Lactose (%)	4.09[b] ± .41	5.80[c] ± .52	4.30 ± .61	3.50[b] ± .61	4.45 ± .21
Chloride (%)	0.089 ± .01	0.072 ± .01	0.063 ± .01	0.075 ± .01	.08 ± .03
Somatic cells ($x10^3$/ml)	608.240[b] ± 100	606.044 ± 133	735.717 ± 151	1045.212[c] ± 151	709.044 ± 101

[a]Values are least-squares means ± standard errors.
[b,c]Means in the same row not having a common superscript differ (P<.05).

Table 2. Concentrations of some serum constituents in Saidi ewes through weeks of lactation[a]

Item	Weeks of lactation				
	1	2	3	5	Overall
Glucose (mg/dl)	58.4 ± 6.7	64.5 ± 7.6	70.8 ± 8.9	71.9 ± 8.9	65.1 ± 3.9
Cholest.(mg/dl)	65.9 ± 7.6	61.0 ± 10	45.8[b] ± 10	71.8[c] ± 10	61.9 ± 4.4
T.protein (g/dl)	6.16[d] ± .47	6.77 ± .53	5.77[d] ± .62	8.32[e] ± .63	6.67 ± .28
Albumin (g/dl)	3.11 ± .21	3.62 ± .23	3.20 ± .27	3.52 ± .27	3.34 ± .12
Globulin (g/dl)	3.06 ± .46	3.15 ± .52	2.57[b] ± .61	4.18[c] ± .61	3.21 ± .27
Urea N. (mg/dl)	23.2[d] ± 2.0	27.2 ± 2.3	33.1[e] ± 2.7	22.8[d] ± 2.7	26.0 ± 7.6

[a]Values are least-squares means ± standard errors.
[b,c]Means in the same row not having a common superscript differ (P<.07).
[d,e]Means in the same row not having a common superscript differ (P<.05).

Figure 1. Milk protein, fat, and chloride concentrations in Saidi ewes

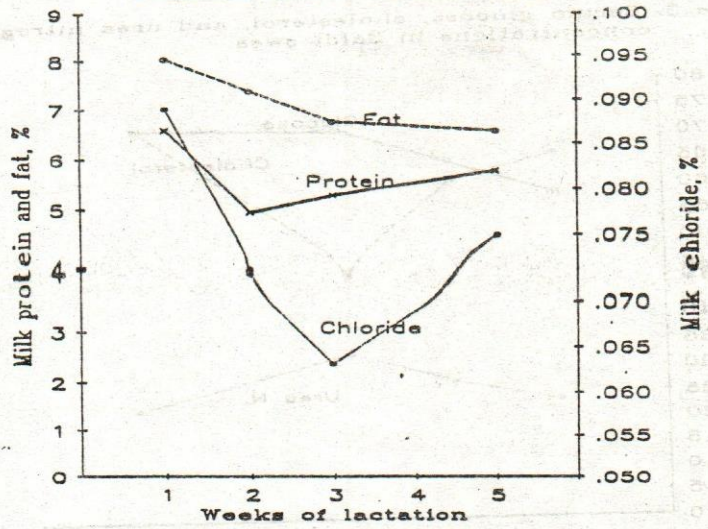

Figure 2. Milk lactose and somatic cell concentrations in Saidi ewes

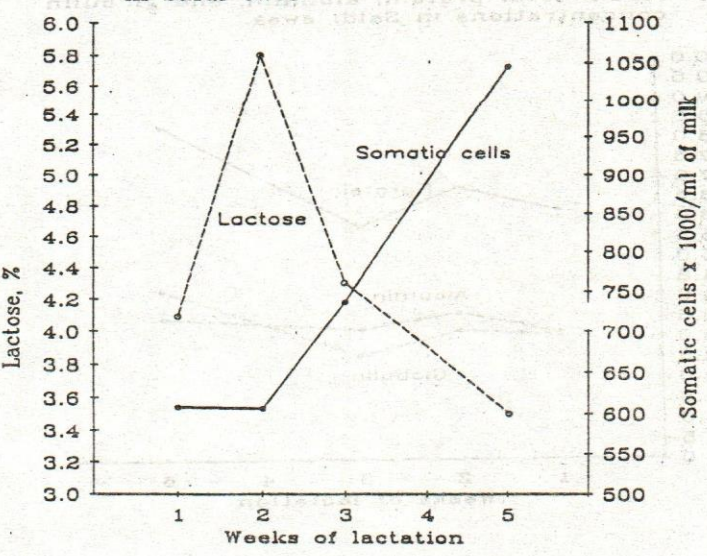

Figure 3. Serum glucose, cholesterol, and urea nitrogen concentrations in Saidi ewes.

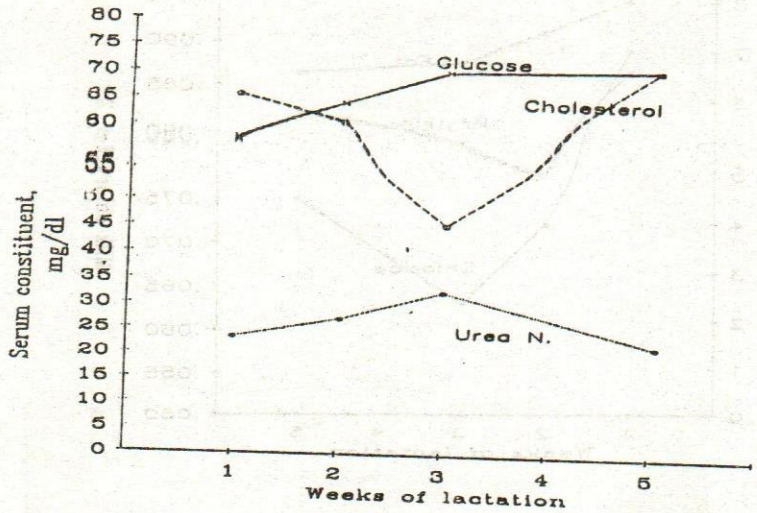

Figure 4. Serum total protein, albumin, and globulin concentrations in Saidi ewes.