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THE RELATION BETWEEN MOTHER COLOSTRUM AND NON-SPECIFIC NEONATAL IMMUNITY IN CAMEL

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SUMMARY

Levels of both total serum protein and γ-globulin were determined in 8 newborn camels from birth up to 30 days of age using cellulose acetate plate of protein electrophoresis technique. The overall mean total serum protein and γ-globulin concentration were low at birth (8.08 and 0.14 gm/dl), and reached their peak around 24 hours (9.3 and 1.8 gm/dl) respectively, while colostral protein decrease in its content during the first day from 10.15 to 8.3 gm/dl. The concentration of total protein and γ-globulin in colostrum and milk were highly significant (P<0.05) with those of the serum of neonatal camels. The study concluded that the neonatal total serum protein content can be used as index of immune transfer from dams to neonatal camels.

Keywords: Immunoglobulin, colostrums, immunity and camel calves.

INTRODUCTION

In nature, except for air, the only external source of every thing to the neonate is the mother's colostrums and milk. The neonate is constantly and rapidly changing, both structurally and physiologically. In the uterus, the fetus is living in a warm, moist, protected environment, and receiving all its needs from the mother. At birth the newborn camel goes from sterile womb to an environment filled with many infectious agents. Protection against those possible sickness causing invaders comes from the dam's colostrums. Immunity is developed through her daily existence with the exposure to barnyard contaminants as well as immunizations. She might have been given over the years, protection comes in the form of antibodies.

It has been emphasized in many circumstances that appropriate serum Ig level ensures better protection against infectious diseases in lambs **(Sawyer et al., 1977)**, goat kids **(Vihan, 1988; O'Brien and Sherman, 1993)** and calves **(Quigly et al., 1995)**. Ingestion and absorption of immunoglobulines, principally IgG, via colostrum are considered the major factors influencing newborn kid serum immunoglobulines concentration **(Hunter et al., 1977; Stott and Fellah, 1983**

and Marin et al., 1977).

This work was designed to detect the amount of immunoglobulines in the colostrum of the she-camels as well as the successive changes in the immunological level in the serum of camel calves from parturition up to one month of age.

MATERIAL AND METHODS

Animals

The experimental animals used in this study comprised eight pregnant she-camels 4-5 years old. Eight newborn camels were assigned just after parturition to study the relationship between colostrums and non specific immunity from birth up to one month of age. All of which were maintained at the Maryout Research station belonging to Desert Research Center (DRC), 35 Km west of Alexandria, from February to April 1999.

Sample collection:

Neonatal camel calves were separated from their mothers immediately after birth. Total mammary secretions from individual mother were manually collected by aseptic techniques immediately after parturition (0 time) and at 6 h, 12 h, 18 h, 24 h, 36 h, 48 h, 7th day, 21st day and 30th day post-partum, respectively. Samples were drawn to give a representative aliquot from each milking and the rest of them were returned to nurse the camel calves. Samples were placed in vials and stored at -20°C for total protein determination. Blood samples were withdrawn from neonatal camel calves through jugular vein puncture and the sera were separated to give a representative all alone from each sample time within the same intervals. The samples were collected during winter 2003.

Sample analysis:

Determination of total protein:

The newborn sera, the dam's colostrums and milk samples were subjected to determination of total protein concentration according to Lowery method (**Lowery et al., 1951**).

Sample analysis by electrophoresis:

The newborn sera and the dam's colostrums and milk samples were analyzed by total protein

electrophoresis with Helena. Titan cellulose acetate plate (cat No. 3023. Helena laboratories, Beaumont. Texas) for separation and quantification of γ-globulin by using Helena electrophoresis scanner .

Plate preparation:

Titan cellulose acetate plates (cat No. 3023. Helena laboratories. Beaumont, Texas) were coded by marking on the glossy hard side and then soaked for 20 minutes in diluted Electra HR buffer (cat. No.5805).

Electrophoresis chamber preparation:

Approximately 100ml of diluted HR buffer was poured into each of the outer sections of the electrophoresis chamber. Two disposable wicks were wetted in the buffer and stand on edge in the buffer compartments. The top edge of each wick was folded over each support bridge and the top edge pressed down over the bridge until the wick contact with the buffer. The chamber covered to saturate the air with buffer.

Sample application :

Each well in the sample plate was filled with 3ul of the sample using microdispenser. The applicator tips were depressed into the sample wells 3 to 4 times. The wetted Titan plate was removed from the buffer with the fingertips blotted once firmly with a blotter. The sample was applied to the plate by gentle depressing the applicator tips into the sample well 3 or 4 times and then the applicator was transferred to the aligning base. The button was pressed down and hold for 5 seconds.

Eleetrophoresis :

Quickly the plates cellulose acetate were placed side down in the eleetrophoresis chamber. A coin was placed on the plates to insure contact with the buffer. The chamber was covered. The plates were electrophoresed for 15 minutes at 180 volts.

Visualization of the protein bands:

At the end of the electrophoresis time, the plates were removed from the chamber and placed

in 50ml of Ponceau S stain for 6 minutes. The plates were destained in 3 successive for each 2 minutes washes of 5% acetic acid, then the plates were dehydrated in 2 successive for each 2 minutes with methyl alcohol and finally for 3-5 minutes in clearing solution and dried at 60 oc

Evaluation of the protein band:

The plates were scanned in densitometer (scanner) using 525 nm filter and the narrow slits (size 4).

Statistical analysis:

The data were analyzed by General linear model procedure (GLM) model of SAS (SAS, 1989) for determination the relationship between the level of total protein and gamma globulin of colostrum and newborn sera at varies ages. The Duncan's multiple range tests was used to compare means of various times.

RESULTS AND DISCUSSION

Electrophoresis of neonatal camel serum protein:

A typical electrophoresis of serum protein of normal suckling neonatal camel within one week after birth by the use of commercial Titan III cellulose acetate plate is shown in figure (1). The major protein fractions were divided according to the recommendation by the manufacture from cathode to anode as albumin, alpha-globulin-I, alpha-globulin-II, and γ-globulin, respectively. The γ-globulin fraction in colostrums and milk collected at the same intervals were similarly separated and quantified as was described previously **(Chen et al., 1998)**.

Patterns of change in total protein and γ-globulin of colostrum, milk and neonatal camel serum:

Results revealed a progressive changes in concentrations of total protein and γ-globulin in colostrums, milk and calf serum following parturition are shown in figures 2 and 3 respectively. The overall mean colostrum and milk total protein dropped gradually from 10.15gm/dl at parturition to 4.3 gm/dl at one moth old. Similar changes in colostrum and milk γ-globulin concentration were observed, where mean concentration at parturition, 72 hours and 30days after parturition was 6.78, 0.82 and 0.35 gm/dl, respectively.

During the first 24 hours, colostral protein decrease in content from 10.15 gm/dl to 8.3 gm/dl as shown in table (1), which apparently was mainly caused by the concomitant decrease in γ-globulin content. The same trend was also found in the study of **Quiles et al., 1991** on goats during similar intervals.

Before 24 hours, concentrations of neonatal camel calves' sera total protein and γ-globulin increased from 8.08 and 0.14 gm/dl at birth and reached their peak at 24 hours at normal colostrum feeding to 9.3 and 1.8 gm/dl, respectively and then undergo decreasing trend till one month old (figure 2). The time that serum protein and γ-globulin start to reach a nearly stable level coincided with the time of colostrum transition in terms of total protein and γ-globulin contents **(Donovan et al., 1986)**.

At 30 days of age, although serum total protein of neonatal camel calf level was in serum (6.78 versus 4.3 gm/dl), the γ-globulin concentrations were nearly similar (0.39 versus 0.35 gm/dl) which proved that colostrums (milk) is the only source of antibodies to camel newborns to enhance their immunity and hence their ability to challenge the different causes of infection.

The concentration of serum γ-globulin following initial suckling in this study was comparable to that found in small ruminants such as lamb **(Hunter et al., 1977; Al-Jawad and Lees, 1985 and Sawyer et al.,1977)**, goat kids **(Constant et al., 1994)** and crias of llama and alpacas **(Bravo et al., 1977)**. There are some differences in peak time as well as peak value, partly caused by differences in species and methodologies. Changes in the neonatal camel serum total protein concentration more or less were parallel to those of serum γ-globulin following birth, which was also indicated by **Donovan et al., 1986** and on this base that neonatal serum total protein content was used as an index of immune transfer.

In conclusion, the result indicated that γ-globulin in colostrums were significantly higher during the first 48 hours than their counterparts in serum after that, a reverse trend was found till 30 days of age where values of γ-globulin tended to be higher in serum than in colostrum (milk). This might reflect increasing the potentiality of the camel calves' immunity that enabled them to persist and resist many infectious diseases. Likewise, total protein followed the same trend that found to be parallel to that of γ-globulin which confirms the above mentioned results.

Acknowledgment

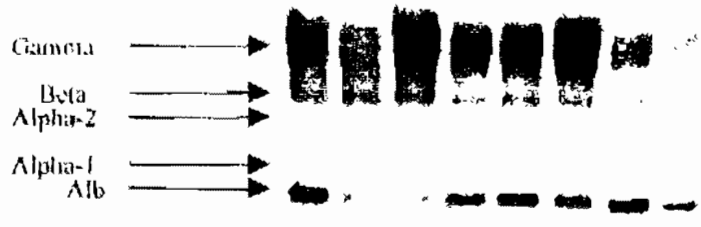
The author gratefully thanks Dr. Sayed Abd El-Baky for his great help in the electrophoresis work.

Table (1) Mean value of total proteins, γ globulin concentration in colostrums of she-camels and serum of neonatal camels at birth up to one month age (n=8).

Times	Colostrum (milk) of She camels		Serum of neonatal camel calves	
	Total protein (g/dl)	γ - globulin (g/dl)	Total protein (g/dl)	γ - globulin (g/dl)
0 (at birth)	$10.15^{a} \pm 0.05$	$6.78^{a} \pm 0.04$	$8.08^{f} \pm 0.09$	$0.14^{j} \pm 0.00$
6 hours	$9.23^{b} \pm 0.06$	$5.84^{b} \pm 0.01$	$8.50^{dc} \pm 0.06$	$1.63^{g} \pm 0.02$
12 hours	$8.30^{e} \pm 0.06$	$4.00^{e} \pm 0.12$	$8.90^{bc} \pm 0.04$	$1.70^{ab} \pm 0.00$
18 hours	$8.5^{d} \pm 0.07$	$2.43^{d} \pm 0.01$	$9.10^{ab} \pm 0.04$	$1.75^{b} \pm 0.02$
24 hours	$8.80^{d} \pm 0.07$	$2.26^{e} \pm 0.01$	$9.30^{a} \pm 0.06$	$1.80^{c} \pm 0.00$
48 hours	$7.43^{e} \pm 0.11$	$1.80^{f} \pm 0.06$	$9.09^{ab} \pm 0.09$	$1.25^{d} \pm 0.00$
72 hours	$7.00^{f} \pm 0.08$	$0.82^{g} \pm 0.01$	$8.70^{cd} \pm 0.04$	$1.00^{e} \pm 0.04$
7 days	$5.50^{g} \pm 0.12$	$0.54^{h} \pm 0.00$	$8.40^{e} \pm 0.00$	$0.70^{f} \pm 0.04$
14 days	$5.08^{h} \pm 0.08$	$0.47^{hi} \pm 0.01$	$7.90^{f} \pm 0.08$	$0.50^{g} \pm 0.00$
21 days	$4.84^{i} \pm 0.10$	$0.43^{hi} \pm 0.01$	$7.50^{g} \pm 0.12$	$0.50^{h} \pm 0.02$
30 days	$4.30^{j} \pm 0.06$	$0.35^{i} \pm 0.00$	$6.78^{h} \pm 0.11$	$0.39^{i} \pm 0.02$
F-value	619.82**	2793.49**	97.75**	828.59**

Means followed by different letter (s) in the same column are differed significantly at P≤0.05.* Highly significant at P≤0.01**, SE=Standard error.

Figure (1): Serum protein electrophoresis of newborn camel calf.



Gamma= Gamma globulin, Alpha-1= Alpha-1 globulin, Alpha-2= Alpha-2 globulin Beta= Beta globulin and Alb=Albumin.

Figure (2): Progressive changes of total protein concentrations of colostrums (milk) and neonatal camel serum post-partum.

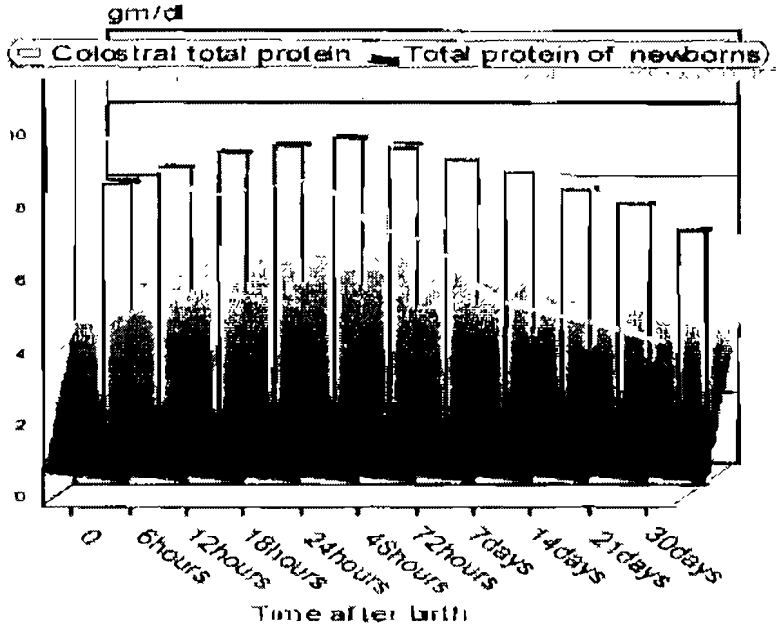
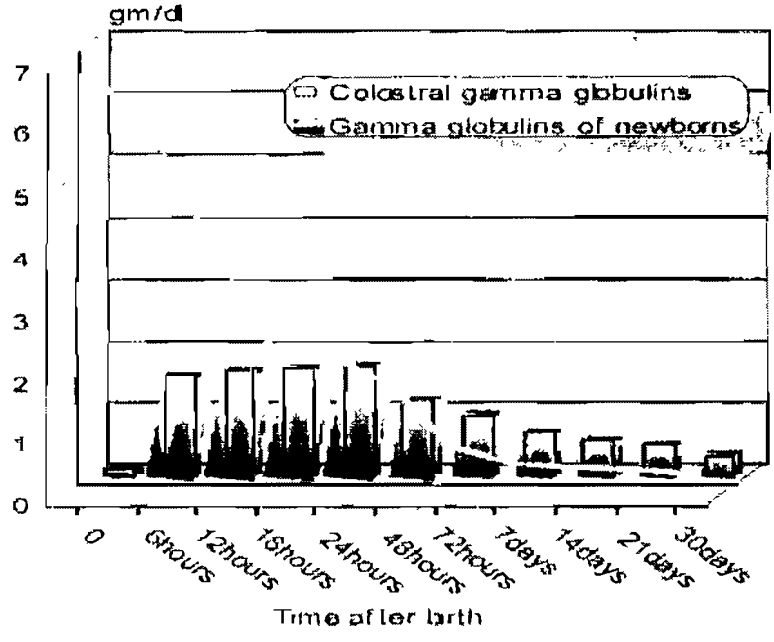


Figure (3): Progressive changes of Gamma globulin concentrations of colostrums (milk) and neonatal camel serum post-partum.



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الملخص العربى

العلاقة بين لبن السرسوب والمناعة الغير نوعية فى الإبل

د/ ياسر محمود كامل

شعبة الإنتاج الحيواني - مركز بحوث الصحراء - المطرية - القاهرة.

تم عمل الدراسة على عدد (٨) أنثى جمل أمهات تتراوح أعمارهن مابين ٤-٥ سنوات بمحطة بحوث مريوط التابعة لمركز بحوث الصحراء، فتم متابعة مستوى البروتين الكلى والأجسام المناعية (الجاما جلوبيولين) فى كلاً من لبن السرسوب للأمهات وسيرم الدم لصغار الجمل حتى عمر شهر من الميلاد وذلك باستخدام طريقة الفصل الكهروكيميائى، وبحساب مستوى البروتين الكلى والأجسام المناعية بالدم فكان المستوى منخفض لكليهما عند الولادة ٨٠ر٨جم/ ١٠٠ملى و ١٤ر٠ جرام / ١٠٠ملى على الترتيب كما وصلا إلى أعلى المعدلات لهما بعد حوالى ٢٤ ساعة من رضاعة لبن السرسوب فكان مستوى البروتين الكلى ٩ر٣ جرام / ١٠٠ ملى بينما كان مستوى الجاما جلوبيولين ١ر٨ جرام / ١٠٠ ملى. كما أعطت النتائج فرق معنوى فى حساب مستوى البروتين الكلى والجاما جلوبيولين فى كلاً من السرسوب واللبن مع المستوى الموجود فى سيرم الدم لصغار الجمل، وبهذه النتائج أثبتت الدراسة أن حساب مستوى البروتين الكلى فى الدم يمكن إستخدامه كدلالة على نقل المناعة السلبية من الأمهات إلى الصغار.