

## COMPARATIVE STUDY ON IMMUNOLOGICAL CHARACTERISTICS OF HUMAN, GOATS AND CAMEL COLOSTRUMS THROUGH THREE DAYS AFTER PARTURITION

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### ABSTRACT

Since goat milk is always been advised to be a good substitute for human milk for infants feeding and recently camel milk is coming with same understanding. So the objective of this study to find the similarities in hemoglobin (IgA) and (IgG) concentration in human, goat and camel colostrums. This study was conducted at three locations: 1- Sudan University of Science and Technology- College of Agricultural Studies- Department of Animal Production farm, 2- El-Soudy Maternal Hospital in Omdurman, 3- a Dairy Camel Farm in Omdurman. Seven lactating mothers, seven lactating pure Nubian goats and four lactating she camels, all recently delivered, were in a good health. Three samples of the second parity order and four of the third parity order were collected from each subject and subjected to immunological analysis in Saradar laboratory Dokki-Egypt to test the concentration of immunoglobulins IgA and IgG in the colostrums of those subjects. The results of the second and the third parity order showed no significant difference ( $P>0.5$ ) in colostrums immunoglobulin in the three subjects. Also, no significant difference ( $P>0.5$ ) through the three days after parturition, however, within the subjects, a significant difference ( $P<0.5$ ) was observed in IgA and IgG of colostrums of each subject. Also the results showed that camel's colostrums were similar to human colostrums in IgG concentration compared to goats colostrums. Whereas, the IgA concentration in goats' colostrums was similar to human colostrums compared to she camel colostrums, but all of them fall within the same range of in significance. From this study, it was concluded that human, goats and she camel were similar in their colostrums immune bodies, but more research is needed to know the absorption mechanism of those two antibodies and their efficiency in acquiring immunity against pathogens.

**Key words:** IgA, Chitotriosidase Enzyme and IgG

### INTRODUCTION

Colostrums are a viscous mammary secretion during the first three days of lactations. It provides all the essential components of nutrition (Smith and Vies, 1992). Immunoglobulins present in the body are produced by plasma cells that were originally derived from bone marrow cells. These plasma cells are present in various locations in the body and secrete Ig that collects in the blood and then can be utilized by the new born needed immune response. Immunoglobulin's are divided into five classes (IgG, IgA, IgM, IgD, IgE). IgG, IgA and IgM are the three main classes. Although these classes, differ in their structure and function (IgG and IgM function in systemic infections while IgA function with internal body surface such as the intestine (Muller and Ellinger, 1981). Immunoglobulin concentration in colostrums vary not only from those found in blood, as noted earlier, but from those found in milk followed in colostrums IgG (190mg/dl), IgA (440mg/dl) and IgM (490mg/dl). In the milk 53mg/dl in IgA, 40mg/dl in IgG and 50mg/dl in IgM (Larson, 1980). Many researches confirmed the presence of an enzyme called chitotriosidase (ChT) which has an

effective role in the immunity (ChT) is an important component of innate immunity against pathogens (Argiillo *et al.*, 2006).

Chitotriosidase (ChT) Enzyme is able to hydrolyze chitin in the cell wall of fungi and nematodes (Barone *et al.*, 1999). The immune role of (ChT) is well known in humans and goats, but no information is available about its immune function in other animals; thus, it is possible that this enzyme plays a role in defending against parasitic and fungal infections in goats. Argiillo *et al.* (2006) reported that ChT activity in goat kid blood serum increased with age from 2,664 to 9,231 nmol/mL per hour at birth and day 49 of life, respectively. However, there are no available data regarding the relationship between the quality of colostrum and (ChT) activity in goat kid blood. Although, researches on (ChT) has been undertaken in human and goats colostrums (Musumeci 2005).

Since goats milk is always devised to be a good substitute for human milk for infant feeding. Recently she camel milk was brought with the same understand. Accordingly to this believe, this research is trying to find similarities in immunoglobulins

concentrations of human, goat and she camel colostrums.

## MATERIAL AND METHODS

### Site of the research:

This study was conducted in three different sites. ELsoodi Maternal Hospital for human in Omdurman, Department of animal production at Shambat Sudan University of Science and Technology for the Nubian goats experiment and the experimental camels were selected from camel dairy farm at west Omdurman, Sudan. Duration of the experiment was five months extending from first of December 2017 till the April 2018.

### Sample collection

21 colostrums samples collected from seven mothers, all mothers were apparent good healthy and delivered health, full term infants. The mothers were at middle status and ranged in 20-38 years. 21 samples from goats colostrums from seven goats and 12 samples of camel colostrums from four camels. All of the subjects were in an apparent good health. Samples were collected from each subject at the first three days of their delivery. Total collected colostrums samples were 54 samples.

### Method of collection

With the aid of professional nurses and ethical approval, human samples were collected from recently delivered mothers by using either manual expression or breast pump and sterile tube for each mother breast. The mothers were of middle socioeconomic status. Of the mothers who participated three in parity order two and four in parity order three. For goats colostrums samples were collected on the first three days of recently delivered goats by using hand milking by professional milkers in sterile tubes and the same procedure was followed for camel colostrums. Sanitary measure was followed to assure the accuracy of the results. 12 ml of colostrums samples were collected from each subject. 2 ml of each sample immediately refrigerated at 5°C after collection, with all the precaution needed for three months. Then kept on ice pox and sent to Saradar Laboratory at Dokki –Egypt to analyze immunoglobulin's concentration in the samples.

### Ethical approval:

It was issued from the Ministry of Health, Khartoum State- Sudan.

### Immunological test

Immunoglobulin diagnostics Kits (India) were used to determine concentration of followed parameters in colostrums samples: Immunoglobulin A (IgA) and

immunoglobulin G (IgG); parameters were determined by Turbid Metric Technique using Turbi-Quick Device.

### Determination of immunoglobulin IgA and IgG in human, goats and she camel colostrum:

The IgA is quantified by turbidimetric test for measurement of IgA and IgG in colostrums. Anti-human IgA and IgG antibodies when mixed with the sample containing IgA or IgG, from insoluble complexes. These complexes cause an absorbance change, depending upon the IgA OR IgG concentration of the sample that can be quantified by comparison from a calibrator of known IgA or IgG concentration.

### The procedures followed:

200µl of saline solution (Nacl 9%) was pulled by pipette into the container, 50 µl of samples (sample dilution) were added. After that 500µl of saline were added to 25µl sample dilution (sample preparation), after that 400µl buffer plus 50µl of sample preparation were added in Cuvette. The Cuvette in the position 1-4 was incubated at least for 1 minute after that each Cuvette was transferred in the reading channel and, when request on the display 100 µof R2 were added. Finally read the result which will appear automatically on the reader display after 120 sec.

### Statistical Analysis

The collected data subjected to analysis of variance using General Liner Model (GLM) of statistical package of social science (SPSS) programmed.

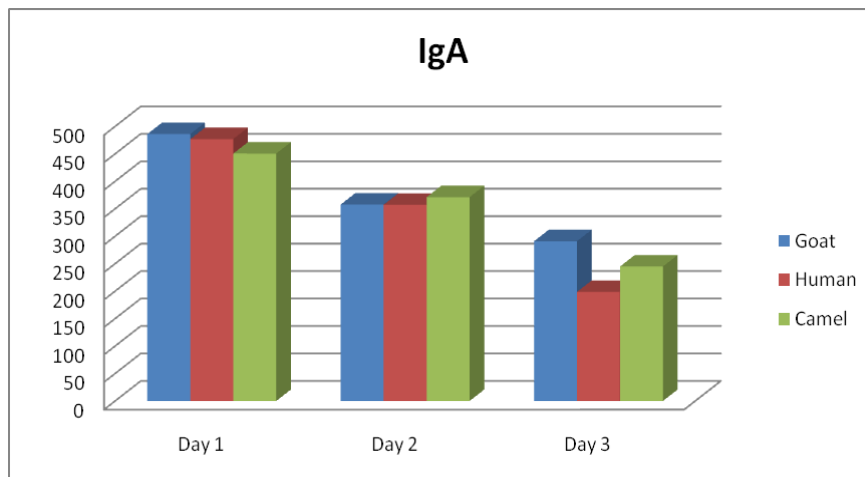
## RESULTS

The effect of days on IgA concentration in the colostrums of goats, human and she camels: The data in table (1) and figure (1) illustrated the level of immunoglobulin A (IgA) concentration mg/dl on colostrual days of goats, human and she camels mg/dl .The data revealed no significant ( $P > 0.05$ ) difference. IgA in day one in the goats colostrums was higher (486.06) than human (476.94) and she camel (450.57). In day two, the result of IgA of goats was similar (357.77) to that of human (357.36) compared to she camels (371.18). However, the results of she camels in day two was higher than that from human and goats. In day three, the result of IgA concentration was more in goats colostrums than the result of human and she camels (290.93), (244.80) and (198.69), respectively. The IgA concentration in goats, human and she camel colostrums was high in first day then declined gradually in second and third days.

**Table 1:** IgA mg/dl content in colostrums of goats, human and she camel through the 3 days after parturition.

Species	Day 1	Day 2	Day 3	Sig
Goat	486.06	357.77	290.93	Ns
Human	476.94	357.36	198.69	Ns
Camel	450.57	371.18	244.80	Ns

NS: non significant difference among treatment.



**Fig. (1):** Express the effect of IgA on days of goats human and she camel colostrums.

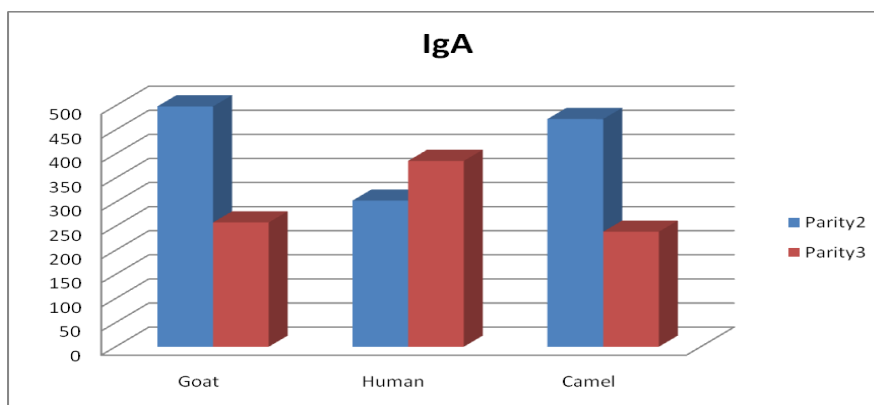
Table (2) and figure (2) show the concentration of IgA (mg/dl) in goats, human and she camels as affected by parity order. The result indicated significant ( $P < 0.05$ ) difference between goats, human and she camels colostrums in second and third parity order. The result of IgA concentration of goat's colostrums was higher in second parity order than that of human and she camels (498.67), (303.08) and (472.42), respectively. Also in the third parity order, the level of IgA concentration of colostrums was

lower in she camels colostrum than that of human colostrum compared to goats colostrums (257.84), (385.58) and (238.62) respectively. On second parity order the result of goats was higher (498.67), and in third parity order decreased (257.84). Also it was high in she camel on second parity order and decreased on third parity order. However, the level of IgA concentration in human decreased in second parity order (385.58) and increased in third parity order (303.08).

**Table 2:** IgA mg/dl on Parity of the goats, human and she camel colostrums.

Species	Parity 2	Parity 3	Sig
Human	303.08	385.58	**
Goat	498.67	257.84	**
Camel	472.42	238.62	**

\*\* = highly significant difference among treatment ( $P < 0.01$ ).



**Fig. (2):** IgA in goats, human and she camel colostrums according the parity order.

### The effect of colostrums days on IgG concentration in goats, human and she camels:

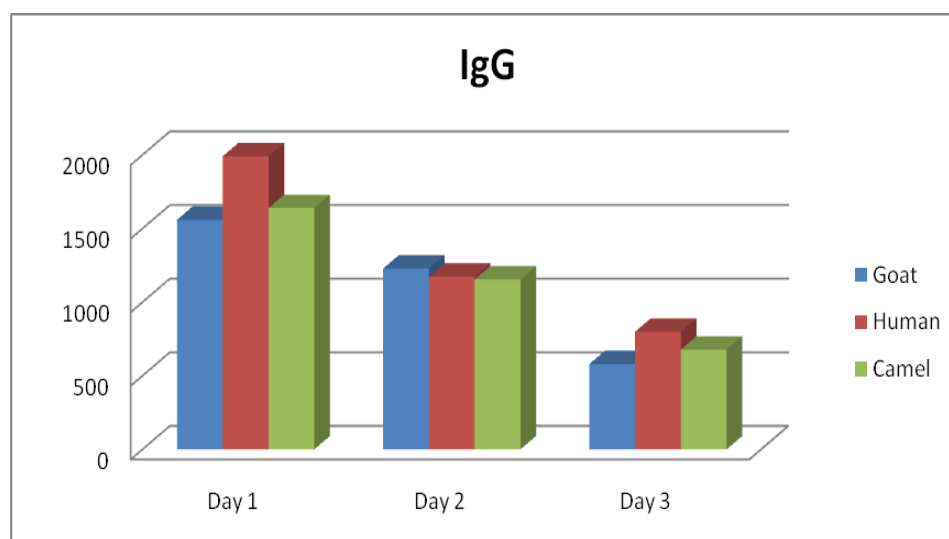
Table (3) and figure (3) showed no significant ( $P > 0.05$ ) difference between the levels of IgG concentration (mg/dl) in colostrums days after parturition in human, goats and she camels. The illustration of levels IgG concentration in the first day after parturition on human colostrums was higher than that of camel and goats (1990.4), (1639) and (1558.4) respectively. The results of level of IgG on

she camels was nearly similar to human compared to goats during the first days of parturition. In the second day, high level of goats colostrums was observed (1227.7), followed by human (1172.4) than she camel (1153.2). In third day the high result was found in human (798.3), followed by she camels (677.5) than goats (578.5). Whereas in the third day, the results were similar in human and she camel compare to goats.

**Table 3:** IgG mg/dl content in colostrums of human, goats and she camel through the 3 days after parturition.

Species	Day 1	Day 2	Day 3	Sig
Goat	1558.4	1227.7	578.5	Ns
Human	1990.4	1172.4	798.3	Ns
Camel	1639	1153.2	677.5	Ns

NS: non significant different among treatment.



**Fig. (3):** IgG of human, goats and she camel colostrums during three days after parturition.

### The effect of parity order on IgG concentration of goats, human and she camels colostrums:

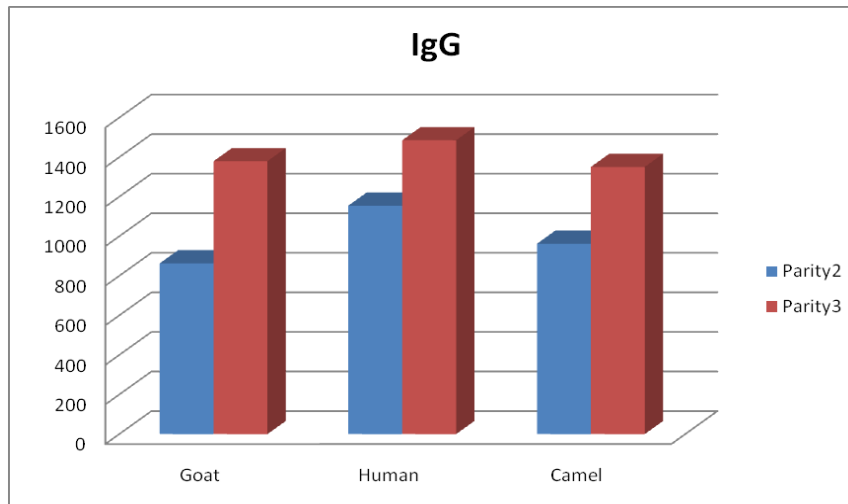
The data in table (4) and figure (4) illustrated the effect of parity order on IgG concentration (mg/dl) in colostrums of goats, human and she camels. The results indicated that parity order had shown significant ( $P < 0.05$ ) difference on the IgG concentration of colostrums. In parity order two, the value of IgG concentration was obtained high in

human (1155.1) followed by she camels (962.5) than goats colostrums (863.2). However in parity three, the concentration of IgG was high in human colostrums (1485.6) followed by that in goats (1351.0) compared to the she camels colostrums (1351.0). Whereas the of IgG concentration IgG during parity two decreased compared during parity order three of human, goats and she camels increased.

**Table 4:** Effect of Parity on IgG concentration of human, goats and she camel colostrums:-

Species	Parity 2	Parity 3	Sig
Goat	863.2	1379.8	**
Human	1155.1	1485.6	**
Camel	962.5	1351.0	**

\*\* = highly significant different among treatment ( $P < 0.01$ )



**Fig. (4):** Explain the effect of parity on IgG concentration of human, goats and she camel colostrums.

## DISCUSSION

The data pertaining to the immunoglobulins in human, goats and she camel colostrum in this study were shown in the above Tables and Figs. IgA in day one in the goats colostrum was higher 486.06 than human (476.94) and she camel (450.57). In day two the result of IgA of goats (357.77) was similar to the results of human (357.36) compared to she camel (371.18), as the results of she camel colostrum in day two was higher than human and goats. In day three the results in goat's colostrums expressed higher IgA than the result of human and she camel colostrum. Significantly, correlated with lactation number, stage of lactation, daily milk yield or due to the nutrition and genetic. IgA concentration in camel and human colostrums were (244.80) mg/dl and (198.69) mg/dl respectively. The IgA concentration in goats, human and she camel colostrums was high in first day and declined gradually in second and third days. This might be due to necessity of immunoglobulins in the first day. The mean total immunoglobulin concentration of goat colostrums was  $54.4 \pm 26.4$  g/L. The level of protein and IgG in goats' colostrums dropped quickly in this study; that agreed with the results of Arguello *et al.*, (2006) who reported that in goat, the level of protein and total IgG contents dropped quickly from the time of birth to 132 hour postpartum.

Also in this study the results of IgA mg/dl was 486.06 in goats colostrums, 476.94 in human colostrums and 450.57 in she camel colostrums were in agreement with the findings Larson (1980) who reported immunoglobulin concentration in colostrums vary not only from those found in blood, but vary from those found in milk followed in colostrums IgG (190mg/dl) and IgA (440mg/dl). In the milk 53mg/dl in IgA, 40mg/dl in IgG and 50mg/dl IgM)

On the other side, the results of IgA level in colostrums showed the level in human (476.94mg/dl). These finding disagreed with Carlsson *et al.* (1980), who indicated that levels in early human colostrums may be as high as (2000 mg/dl) but that the average concentration in mature milk range from 25 to 50 mg/dl. This difference might be due to nutrition, genetic or due to stress of the mother after delivery.

The results of this study have been supported by many researchers and any disagreement mentioned by other researches is verified due to many factors. From another side so, many researches confirmed the presence of an enzyme named chitotriosidase (ChT) which has an effective role in the immunity. ChT is an important component of innate immunity against pathogens. This enzyme was reported to be available only in human and goats colostrums (Arguello *et al.*, 2008). The research of this study unfortunately could not have the facilities to analyze this enzyme to strengths the results of this study.

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### دراسة مقارنة للخواص المناعية لسرسوب الإنسان والجمال خلال ثلاثة أيام بعد الولادة

عبد العزيز مكاوي ، اسماء يحيى ، كوثر عبد الجليل  
 قسم الإنتاج الحيواني- كلية الدراسات الزراعية- جامعة السودان للعلوم و التكنولوجيا

تم إجراء هذه التجربة في ثلاثة مواقع : مزرعة قسم الإنتاج الحيواني – كلية الدراسات الزراعية – جامعة السودان وحيث تم اختيار سبعة ماعز من السلالة النوبية الأصيلة ، كما تم اختيار سبعة من الأمهات حديثي الولادة من المستشفى السعودي بأم درمان وذلك بعد الموافقة الأخلاقية من وزارة الصحة، وكذلك تم اختيار أربعة من الإبل من مزرعة بغرب أم درمان جميعهم حديثي الولادة وفي حالة صحية جيدة. تم أخذ ثلاث عينات من سرسوب الولادة الثانية وكذلك ثلاث من الولادة الثالثة لكل من الحيوانات والأمهات بغرض إجراء التحاليل المعملية لأجسام المناعة (IgA & IgG) وكان ذلك في معمل ساريدار Saredar Lab في الدقي بجمهورية مصر العربية. أظهرت نتائج الولادة الثانية والثالثة في كل العينات عدم وجود فروق معنوية لأجسام المناعة في سرسوب العينات الثلاث خلال الثلاثة أيام الأولى من الولادة للحيوانات والأمهات جميعا بينما وجد فرق معنوي ( $P < 0.05$ ) للأجسام IgG & IgA خلال هذه الأيام داخل كل من مجموعات التجربة. كما أظهرت النتائج بأن سرسوب الجمال يشابه سرسوب الأمهات للأجسام المناعية (IgG) مقارنة مع الأغنام. بينما وجد أن IgA في سرسوب الأغنام مشابه لسرسوب الأمهات مقارنة مع الأبل. وبذلك فقد أستنتج من هذه الدراسة أن سرسوب كل من الأمهات والأغنام والأبل متشابهه في كل التجربة في أجسام المناعة المعنوية IgA & IgG, ولكن يبرجي مزيدا من التقصي لمعرفة الكيفية التي يتم بها إمتصاص هذه الأجسام في العملية المناعية.