

# The Appropriate Time Required for Newborn Calf Camel to Get Optimal Amount of Colostrums Immunoglobulin (IgG) with Relation to Levels of Cortisol and Thyroxin

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**Abstract**—A major challenge in camel productivity is the high mortality rate of camel calves in the early stage due to the lack of colostrums. This study investigates the time required for the calves to obtain the optimum amount of the immunoglobulin (IgG). Eleven pregnant female camels (*Camelus Dromedarius*) were selected randomly and variant in age and gestation. After delivery, 7 calves were obtained and used for this investigation. Colostrum samples were collected from mothers immediately after parturition. Blood samples were obtained from the calves as follow: 0 day (before suckling), 24, 48, 72, 96, 120 and 144 hours, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> weeks post suckling. Blood serum and colostrums whey were separated and used to determine IgG concentration, total protein and concentration of Cortisol and Thyroxin. The results showed high levels of IgG in camel colostrums ( $328.8 \pm 4.5$  mg / ml). The IgG concentration in serum of calves was the highest within 1<sup>st</sup> 24 h after suckling (140.75 mg / ml), and then declined gradually reached lower level at 144 h (41.97 mg / ml). The average turnover rate ( $t_{1/2}$ ) of serum IgG in the all cases was 3.22 days. The turnover of ranged from 2.56 days for calves have values of IgG more than average and 7.7 days for those with values below average. In spite of very high levels of thyroxin in sera of new born the results showed no correlation between cortisol and thyroxin with IgG levels.

**Keywords**—Camel, cortisol, IgG, thyroxin, turn-over rate.

## I. INTRODUCTION

CAMELS (*Camelus Dromedarius*) are animals of significant socio-economic importance since centuries in arid and semi-arid regions in Africa and Asia. They provide milk, meat, hair, skin, manure and also used for transportation. Camels survive and produce milk for prolonged periods and under unfavorable conditions as they have the ability to survive to severe drought conditions. The survival of camel calves depends on the successful body defense against microbial invasions.

Camel calves come to life almost deprived of serum immunoglobulin and depend on colostrums for virtually all its humoral passive immunity [1]. Failure of passive immunity transfer (FPT) due to gut closure may expose calves to incidence of infectious diseases which may lead to high

mortality rate. Lack of adequate transfer of passive immunoglobulin has been associated with increased mortality rate of camel neonates [2]. The main reason is that the calves cannot get enough amounts of colostrums at first hours after birth.

Camel placenta is of Epitheliochorial type; consequently, the newborn are considered gamma globulinemic. The amount of colostrums immunoglobulin can be absorbed will depend on their passive transfer through intestines in the early days. Relation of cortisol and thyroxin to passive immune system in *Camelidae* has not reported yet. Therefore, the objective of this study was to determine the appropriate time that camel calves can get optimal amount required of immunoglobulin (IgG) and to find if there any relationship with cortisol and thyroxin (T4) concentration during the early stage after birth.

## II. MATERIALS & METHODS

To perform this study used 11 pregnant female camels variant in age and gestation. After delivery 7 calves were obtained and used for this investigation. Blood serum and colostrums samples were collected.

Colostrum whey was separated using the method of [3]. To determine colostral IgG, whey was prepared as described by the manufacturer with modification of whey dilution that the concentration 1 / 10 diluted to 1 / 50. This modification was performed due to high concentration of IgG in the camel colostrums. Blood samples were separated by centrifuge (Heraeus, Germany) which used to determine total protein analyzed by Biuret method (Biomaghreb).

IgG was determined using Single Radial Immune Diffusion (SRID) kit (S.A.R.L. Immuno Diffusion Biotechnologies, France). Thyroxin and Cortisol were estimated using ELISA kits (Monobind Inc. and Biocheck) respectively.

Statistical analysis of Data was treated as complete randomizing design (CRD), mean separated by Duncan. Turnover rate was calculated using semi-log curve by (1).

$$K = \frac{\ln \text{conc.}(t_1) - \ln \text{conc.}(t_n)}{t_n - t_1} \quad (1)$$

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### III. RESULTS

In this study, Table I showed that the average concentration of total protein in serum of newborn calves ( $6.02 \pm 1.12$  g /100 ml) immediately after parturition (before suckling) Table I. The highest concentration was reached at 24 h with ( $7.56 \pm 1.06$  g/ 100 ml). In addition, total protein concentration was decreased gradually at 48 h and then there was no observed change until the end of the study.

The results showed that the newborn calves are completely free of immunoglobulin (IgG) at birth (before suckling). The IgG concentration in the blood serum of calves increased significantly ( $p \leq 0.05$ ) after the 1<sup>st</sup> 24 h post suckling with mean ( $140.75$  mg / ml). Moreover, the levels of IgG declined gradually and reached the lower levels at 144 h ( $41.97$  mg / ml). Interestingly, the rate of immunoglobulin (IgG) in newborn calves serum was about 42.8% of the total concentration of IgG in colostrum within 1<sup>st</sup> 24 hours after suckling.

The average of Turn-over rate (K) of IgG was estimated (Fig. 1) with the mean of turn-over rate of IgG was  $K = 0.24$  and the half life  $t_{1/2} = 3.22$  days (77.30h). Calves with IgG values greater than the average [the  $K = 0.27$  and  $t_{1/2} = 2.56$  days (61.40 h)], and those with lower values [(the  $K = 0.03$  and  $t_{1/2} = 7.7$  days (185 hrs)]. These results indicated that the run-over rate of IgG was higher and faster in calves which get high amount of IgG within the first hours post birth, while it was lower and slower in calves which did not get enough amount of IgG. The reason may be, due to the quality and quantity of colostrum, and the time of getting it which must coincide with the speed of intestinal absorption within the first hours after birth.

TABLE I  
AVERAGE OF TOTAL PROTEIN (TP), IMMUNOGLOBULIN (IG), CORTISOL AND THYROXIN DURING: 0, 24, 48, 72, 96, 120, 144 HRS, 2<sup>ND</sup>, 3<sup>RD</sup>, 4<sup>TH</sup>, WEEKS POST-PARTUM

Time (hrs & wks)	Parameters			
	TP (gm / 100 ml)	IgG (mg / ml)	Cortisol (ng / ml)	Thyroxin (ng / ml)
Before suckling	$6.02 \pm 1.12a$	$0.0 \pm 0.0$	$19.0 \pm 7.0a$	$218.3 \pm 19.4a$
24 h	$7.56 \pm 1.06ab$	$140.75 \pm 62.91a$	$14.1 \pm 2.6a$	$222.0 \pm 37.2a$
48 h	$7.01 \pm 1.67ab$	$127.76 \pm 63.1ab$	$22.8 \pm 9.9a$	$197.0 \pm 49.3a$
72 h	$6.58 \pm 1.29ab$	$119.73 \pm 61.78ab$	$23.80 \pm 16.0a$	$171.5 \pm 45.7a$
96 h	$6.76 \pm 0.60a$	$87.88 \pm 60.74abc$	$19.60 \pm 8.5a$	$201.8 \pm 32.0a$
120 h	$7.12 \pm 1.36ab$	$76.02 \pm 48.59bc$	$17.60 \pm 10.5a$	$199.2 \pm 38.7a$
144 h	$6.69 \pm 0.79ab$	$41.97 \pm 5.61cd$	$19.0 \pm 10.4a$	$181.5 \pm 29.3a$
2 <sup>nd</sup> wk	$8.51 \pm 2.59ab$	$42.10 \pm 5.88cd$	$16.60 \pm 10.4a$	$186.6 \pm 29.2a$
3 <sup>rd</sup> wk	$6.96 \pm 1.29ab$	$39.86 \pm 4.42cd$	$16.0 \pm 5.3a$	$191.1 \pm 22.5a$
4 <sup>th</sup> wk	$7.61 \pm 1.79ab$	$38.50 \pm 5.84cd$	$12.8 \pm 5.0a$	$200.0 \pm 33.2a$

Values within column with the same letter are not significantly different ( $p \geq 0.05$ )

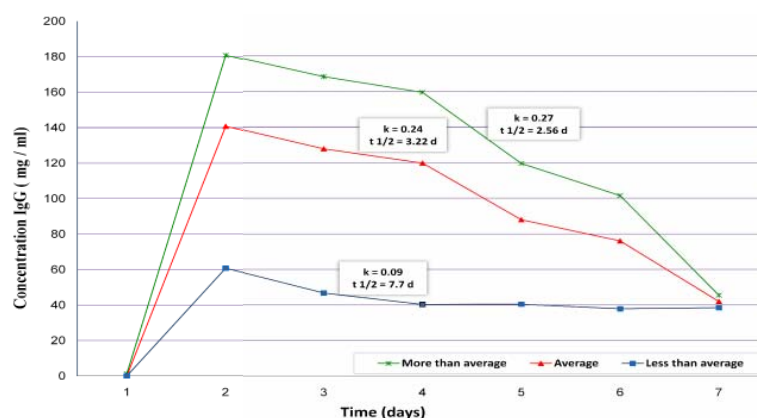


Fig. 1 The average of Turn-over rate (K) of IgG and the concentration of IgG post suckling

In this study, Cortisol levels showed no significant correlation with IgG utilization. Thyroxin serum levels did not show significant changes (range; 171.5 – 222 ng /ml) during the whole period (Fig. 2).

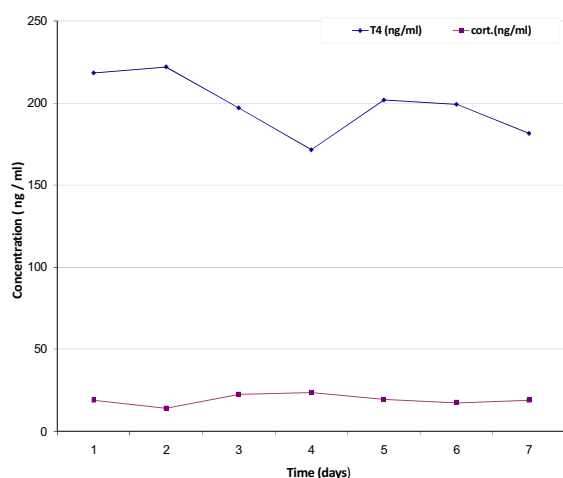


Fig. 2 The concentration of thyroxine (T4) and cortisol (Cort.) post-suckling

There was no significant change of Cortisol and Thyroxin levels in serum of newborns, and no significant correlation was found between IgG level and the levels of Cortisol and Thyroxin.

#### IV. DISCUSSION

The average concentration of total protein in serum of newborn calves immediately after birth (before suckling) reached the highest concentration at 24h. This result was in agreement with [4], but was lower comparing with [5]. Total protein concentration was decreased gradually at 48 h and then there was no observed change until the end of the study.

Measuring IgG concentration showed that the camel newborn calves are completely free of IgG at birth (before suckling), this results was similar to [6] and [7]. The reason of this finding was due to the type of placenta (epitheliochorial) which does not allow passage of mother immunoglobulins to the fetus during pregnancy. Therefore, the calves were born agammaglobulinemic. The increased IgG in the blood serum of calves after the 1<sup>st</sup> 24 h post suckling was reported in foals by [8]. Interestingly, The ratio of IgG in newborn calves serum in this study was about 42.8% of the total concentration of IgG in colostrums within 1<sup>st</sup> 24 hours after suckling. This study indicated that the immunity of camel calves in the first days of life depends completely on the immunoglobulin (IgG) obtained from the ingested colostrums. Therefore, it is very important that newborns should get colostrums immediately after birth (within the first 24h). This will allow the calves to absorb sufficient immunoglobulin (IgG) by the intestinal tissues during the first three days of birth.

Cortisol levels showed no significant correlation with IgG utilization. High levels of cortisol during early hours post-

parturition were reported previously in lambs which led to delay in gut closure and elevation in IgG absorption [9].

Thyroxin serum levels did not show significant changes during the whole period. This was similar to previous study by [10]. There was no significant change of cortisol and thyroxin levels in serum of newborns, and no significant correlation was found between IgG level and the levels of cortisol and Thyroxin.

Turnover rate of IgG was higher in newborns having higher IgG concentration as compared with the newborns having lower IgG concentration which indicate faster utilization of IgG in newborns with highest immunoglobulins.

#### V. CONCLUSION

The results obtained in this study showed three main points; firstly, there is high significant correlation between IgG level and total protein. Secondly, there is no relationship between IgG level and the levels of cortisol and thyroxin. Lastly, the IgG concentration in blood serum of newborn calves increased significantly within the first 24 hours after suckling colostrums. These results indicated that it is very important that newborns should nurse as quickly as possible after birth.

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