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Immune Response and Some Blood Constituents of Calves Produced From Primi- and Multi-Parous Friesian Cows Fed Yeast Culture

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ABSTRACT

This study was conducted to evaluate the effect of dietary supplementation of dairy cows with yeast culture (YC) on immune transfer to their calves during first days after birth and on some blood constituents of calves from birth to 15 wk of age. Total of 15 Friesian cows (weighing 500-520 kg and 2-4 parities) and 15 Friesian heifers (weighing 400-420 kg) at late pregnancy (3 mo pre-partum) were used in this study. All experimental animals were randomly allocated in randomized design to three experimental groups (n=10, 5 cows and 5 heifers in each), fed on the same diet. Animals in 1st group were without treatment, while those in the second (T2) and third (T3) groups were orally administrated with 20 and 40 g/h commercial yeast culture (Thepax) for 90 days pre-partum and 90 days post-partum. After parturition, newborn calves were fed on colostrums of their dams, and then suckled milk up to weaning (105 d of age). Blood samples were collected from all newborn calves at first, second and third day after birth, then at 4, 8, 12 and 15 weeks of age. Hematological parameters including count of red (RBCs) and white (WBCs) blood cells, hemoglobin (Hb) concentration and packed cell volume (PCV) were determined in the whole blood. Concentration of total proteins (TP), albumin (AL), globulin (GL), total lipids (TL), cholesterol (CH), glucose (GLU), creatinine (CR), and thyroid hormone (T_3) as well as AST and ALT activities were determined in blood serum. Results showed insignificant effect of dam parity (cows and heifers) on count of WBCs, Hb concentration and PCV value in the whole blood, serum concentration of immunoglobulines (IgG, IgM and IgA), TP, AL, GL, GLU, CR and T_3, and ALT activity in serum of calves. Concentration of TL and CH, and AST activity were higher, while count of RBCs was lower ($P<0.05$) in calves of heifers than in those of cows. Concentrations of IgG, IgM and IgA were higher ($P<0.05$) in calves of T3 than in T1 by 32, 81 and 112%, respectively. Count of RBCs, Hb concentration and PCV value, and concentration of TP, AL and GL ($P<0.05$) and WBCs ($P\geq0.05$) were higher in calves of T3 than in those of T1 and T2. Calves of T3 showed the highest ($P<0.05$) concentration of TL, CH and GLU and the lowest CR concentration and AST and ALT activity ($P<0.05$). Concentration of T_3 was lower ($P<0.05$) in T2 and T3 than in T1. Concentration of IgG, IgM and IgA in serum and WBCs count of calves decreased ($P\geq0.05$) on the 3rd day after birth. Count of RBCs, Hb concentration and PCV value increased ($P<0.05$) by advancing post-calving week. Only, TP, AL, TL, CH, GLU, CR and T_3 concentrations and activity of AST and ALT showed different trends of changes by advancing post-calving week ($P<0.05$).In conclusion, pre- and post-partum yeast culture treatment at a level of 40 g/h/day for heifers and cows is able to enhance their newborn immunity response and improve calf performance with good health status, which allow for raising good male calves of breeding or female calves of milk production.

Keywords: Cows, calves, immunoglobulines, hematology, blood biochemicals, enzyme, T3.

INTRODUCTION

The transfer of immune antibodies from dairy cows to their foetus during pregnancy does not occur because it has a syndesomochorial placenta (Fröhdeová *et al*., 2014). Calves are dependent directly on intake of colostrum from their dams, which had high antibodies concentrations (Šlosárková *et al*., 2011). It was confirmed that calf passive immunity is provided from absorbed foremilk (Kováč, 2001). In dairy cows, there are relationships between nutrition plan and concentrations of immunoglobulins and biochemicals in calf blood (Godden *et al*., 2009; Bayram *et al*., 2016; Dunn *et al*., 2017).

Yeast culture (YC) is the major common microbial feed additive in animal diets. It can reduce ruminal fermentation and led to high health performance of animals (Nocek *et al*., 2011). It was found that level of total proteins, albumin and immunoglobulin (IgG) in blood serum of dairy cows are associated with energy balance (Tóthová *et al*., 2014). In this way, feeding heifers and cows on dietary YC supplementation increased concentration of crude protein (Fröhdeová *et al*., 2014) and concentration of immunoglobulins (Franklin *et al*., 2005; Fröhdeová *et al*., 2014) and significantly decreased activity of AST and ALT in both cow and heifer newborn blood. The activity of β-1, 3/1, 6-D-glucans and manna-oligosaccharides present in cell walls of YC had perfect stimulate to the immune system and hematological indicators (Heinrichs *et al*., 2003; Milewski *et al*., 2013). Aim of the present study was to evaluate the effect of feeding lactating heifers and cow diet supplemented with yeast culture (Thepax) on immune-response of their offspring fed their colostrums.

MATERIALS AND METHODS

This study was carried out at El-Gemmizah Experimental Station, belonging to Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Animals:

Total of 15 Friesian cows (weighing 500 kg and 2-4 parities) and 15 Friesian heifers (weighing 407 kg) were used in this study. Both heifers and cows were at late pregnancy (3 months pre-partum). The experimental work of this study lasted from December 2013 to July 2014.

Experimental groups:

All experimental animals were randomly allocated in randomized design to three experimental groups (n = 10, 5 cows and 5 heifers in each). Each animal in all groups was fed on basal diet containing of 6 kg concentrate feed mixture (65% un corticated cotton seed cake, 9% wheat bran, 20% rice polish, 3% molasses, 2% limestone and 1% NaCl), 10 kg berseem hay (BH; 2nd cut) and 6 kg rice straw (RS) according to NRC (1988) requirements for dairy cows and heifers. Daily feed allowance for animals were adjusted biweekly based on pregnancy stage and animal weight changes. Animals in 1st group were without treatment, while those in the second (T2) and third (T3) groups were orally administrated with 20 and 40 g commercial yeast culture (Thepax 100R, Dox-A1 Italia SpA, Sulbiate, Italy) per head for 90 days pre-partum and 90 days post-calving. Thepax 100R is new in-activate selected strains of *Saccharomyces cerevisiae* grown in suitable medium to a final concentration of $1x10^{10}$ CFU g^{-1}). Fresh water was freely available.

After parturition, newborn calves were fed on 1.5-2 kg of colostrum from their dams by feeding bottle within 30 minute, and then they were suckled from their dams for three consecutive days, then suckled dam milk up to weaning age (105 d).

Blood sampling and analysis:

Blood samples were collected from all newborn calves by jugular venipuncture before receiving colostrum at first, second and third day post-calving, then at 4, 8, 12 and 15 weeks of age. Blood samples were centrifuged at 3000 rpm for 20 min and the serum samples were stored at -20°C till analysis. Blood serum were analyzed for concentration of total proteins (Henry, 1964), albumin (Doumas *et al*., 1971), total lipids (Zollner and Kirsch, 1962), cholesterol (Richmond, 1973), glucose (Trinder, 1969) and creatinine (Bartles *et al*., 1972). Also, activity of asprtate (AST) and alanine (ALT) transaminases was determined in blood serum according to Reitman and Frankel (1957). However, concentration of globulin was computed by subtraction of albumin from total protein concentration.

In addition, concentration of triiodothyronine (T_3) in blood serum were estimated using radioimmunoassay (RIA) commercial kits (Coat-A-Count®-TKT31) by Automatic Mini-Gamma Counter (LKB-1275) according to Saunders (1995). Immunoglobulin G, M and A concentrations in the serum were determined with the quantitative ELISA (Bovine IgG, IgM, and IgA ELISA Quantitative kit, Bethyl laboratories, UK) according to Killingsworth and Savory (1972).

Hematological parameters including hemoglobin (g/dl) and packed cell volume (PCV %) were directly determined using Mission® Plus kit (REF C132-3031, USA) (Henry, 2001), while red (RBCs) and white (WBCs) blood cells were counted using heamocytometer.

Statistical analysis:

Data were processed with the SPSS analysis program (SPSS version 15, 2010). The detected significant differences were performed at (P<0.05) by Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of treatment of dams with yeast culture on:

Concentration of immunoglobulin in blood of calves:

There was no significant effect of dam parity (heifers or cows) on calf serum immunoglobulines concentrations, while, calf serum IgG concentrations were significantly (P<0.01) affected by dam yeast culture supplementation. Immunoglobulines concentrations, including IgG, IgM and IgA, in blood serum were significantly (P<0.05) higher in calves produced from T3 than those of T1 by 32, 81and 112%, respectively. However, immunoglobulines concentrations insignificantly increased in T2 as compared to T1 (control, Table 1). This trend may suggest higher response of high than low dose of YC in dam treatment.

Table 1. Mean and standard error of immunoglobulin concentrations in blood serum of calves as affected by dam parity, YC treatment, post-calving day and their interactions.

Item	Type of immunoglobulin		
	IgG (g/l)	IgM (g/l)	IgA (g/l)
Effect of dam parity (P):			
Heifers	13.52±0.59	1.80±0.15	0.40±0.05
Cows	14.82±0.74	1.71±0.13	0.52±0.08
Effect of YC treatment (T):			
T1 (control)	12.72±0.69^b	1.36±0.10^b	0.32±0.05^b
T2 (20 g YC)	12.99±0.64^b	1.44±0.13^b	0.37±0.06^b
T3 (40 g YC)	16.80±0.80^a	2.47±0.14^a	0.68±0.10^a
Effect of post-calving day (D):			
Day-1	14.57±0.84	1.93±0.19	0.52±0.08
Day-2	14.22±0.88	1.75±0.17	0.50±0.10
Day-3	13.71±0.80	1.59±0.16	0.36±0.05
Interactions:			
P x T	P<0.91	P<0.68	P<0.73
P x D	P<0.98	P<0.95	P<0.67
T x D	P<0.99	P<0.98	P<0.89
P x T x D	P<0.99	P<0.97	P<0.91

Means denoted within the same column for each factor with different superscripts are significantly different at P<0.05.

There was no significant effect of all interactions on immunoglobulines concentrations of calf serum. Therefore, the present results indicated beneficial effect of dam treatment with YC on increasing calf immunity in terms of increasing level of IgG, IgM and IgA.

It is of interest to not that increasing immunoglobulines concentration in blood serum of calves was associated with increasing concentration of total proteins and globulin concentration in blood serum (Table 3).

As affected by placenta type, dairy calves are born with not fully mature immune system and the transfer of antibodies from their dams provided just after parturition by the high concentration of immunoglobulines in colostrum (Šlosarkova *et al*., 2011). There are three types of immunoglobulines in dairy cattle colostrum, IgG, IgM and IgA these antibodies are proteins which produced in reaction to stimulation by bacteria and viruses (Murphy *et al*., 2005; Tvrznik *et al*., 2008). Some authors indicated presence of ≥10 mg IgG/ml in blood of calves in the first few days of age for successful immunity passive transfer (Pavlata *et al*., 2005; Godden, 2008; Logue and Mayne, 2014). In our study, YC treatment of dams at a high level (40g/dam) increased IgG concentration not only above 10 mg/ml, but also increased than that of control dams by 32% (Table 1)

In the same trend, Fröhdeová *et al.* (2014) found significantly positive effect of the addition of Saccharomyces cerevisiae to dairy cows on calve serum IgG content. In accordance with the present results, Murphy *et al.* (2005) found no significant effect of cow breed type on the serum IgG1 concentration pre- and pos-tpartum or on the colostrum IgG1 concentration. They also found no significant correlation between the IgG1 concentration in the calf serum and in the cow serum.

Moreover, Ježek *et al.* (2012) found lower concentrations of IgG, IgM and IgA in blood of calves in the 1st week after birth and also at 4 weeks of age as compared to that in the 1st week of age. Concentration of IgG, IgM and IgA determined in our study are similar to that established by some authors (Erhard *et al*., 1999; Panivivat *et al.,* 2004). These findings indicated marked reduction in concentrations of IgG, IgM and IgA in blood of calves, starting immediately after birth up to 4 weeks of age.

The quality of colostrum was positively correlated with the concentration of IgG, IgA and IgM in the calves' serum in the 1st week and with the IgG in the 4th week of life (Ježek *et al.* (2012). Such results may prove the effect of YC treatment on improving quality of colostrums, in particular, those in T3. In this respect, Bender and Bostedt (2009) found a significant correlation between IgG and IgM in colostrum and in calf serum at the age of 24 hours. Also, Mallard *et al.* (1998) and Heriazon *et al.* (2011) believed that the immune status of a cow in the period around calving importantly influences passive immunity and health of a calf due to mechanisms that allow the transport of immunoglobulin and cells from blood into mammary gland secretions.

Hematological parameters of calves:

Effect of dam parity was significant (P<0.05) only on red blood cells (RBCs) count, being higher in cows than in heifers calves. However, white blood cells (WBCs) count, hemoglobin (Hb) concentration and packed cell volume were not affected significantly (P<0.05) by dam parity. However, treatment revealed significantly (P<0.05) higher RBCs count, Hb concentration and PCV, and insignificantly lower WBCs for calves of T3 than those of T1 and T2. Yet, all hematological parameters were affected significantly by post-calving week exceed WBCs. While, there was no significant effect for all interactions (Table 2).

It is of interest to note that all experimental groups showed normal values of all hematological parameters studied as reported for dairy cows (Winnicka, 2008; Botezatu *et al*., 2014). As proved in our study, hematological parameters were affected by different factors including nutrition additive (Radkowska and Herbut, 2014) of dairy cows, and they were used for evaluating animal health and stress (Anderson *et al*., 1999).

In this respect, the addition of yeast by-product (Heinrichs *et al*., 2003) or yeast culture (Ghazanfar *et al*., 2015) was affected on hematological parameters of dairy cows. Generally, these results indicated that addition of YC up to 40 g/h in diet of lactating dams resulted in the best values of hematological parameters for their calves which reflected in palpable increase in immunity status of calves.

Table 2. Mean and standard error of hematological parameters of calves as affected by dam parity, YC treatment, post-calving week and their interactions.

Item	Hematological parameter			
	RBCs (10^6/mm^3)	WBCs (10^3/ mm^3)	Hb (g/dl)	PCV (%)
Effect of dam parity (P):				
Heifers (H)	7.67±0.25^b	9.58±0.53	11.04±0.33	33.12±0.85
Cows (C)	8.24±0.20^a	9.84±0.45	10.74±0.29	31.56±0.74
Effect of YC treatment (T):				
T1 (control)	6.99±0.23^c	10.82±0.53	9.82±0.35^b	29.97±1.06^b
T2 (20 YC)	7.65±0.24^b	9.46±0.63	10.61±0.32^b	31.37±0.82^b
T3 (40 YC)	9.23±0.21^a	8.84±0.59	12.24±0.31^a	35.68±0.71^a
Effect of post-calving week (W):				
0 wk	7.55±0.31^b	9.16±0.93	10.82±0.51^{ab}	30.57±1.60^b
4 wk	7.52±0.32^b	9.55±0.76	10.61±0.44^{ab}	32.26±1.24^a
8 wk	7.23±0.40^b	8.89±0.59	10.04±0.57^b	30.67±1.01^b
12 wk	8.53±0.33^a	9.94±0.80	10.99±0.43^{ab}	32.50±1.02^a
15 wk	8.94±0.32^a	10.99±0.73	11.98±0.38^a	35.72±1.07^a
Interactions:				
P x T	P<0.29	P<0.67	P<0.58	P<0.50
P x W	P<0.98	P<0.99	P<0.97	P<0.95
T x W	P<0.90	P<0.99	P<0.99	P<0.99
P x T x W	P<0.99	P<0.99	P<0.99	P<0.99

Means denoted within the same column for each factor with different superscripts are significantly different at P<0.05.

Concentration of total proteins and their fraction in blood serum of calves:

Effect of dam parity on concentration of total proteins and their fractions in blood serum of calves was not significant, but treatment effect was significant (P<0.05) on concentrations of total proteins, albumin and globulin, being higher in blood serum of T3 calves than in T1 and T2 calves. Also, post-calving week affected significantly (P<0.05) only on concentrations of total proteins and globulin, showing significant (P<0.05) decrease from calving up to 12 wk, and then significant(P<0.05)increase 15wk post-calving(Table 3).

In agreement with these results, a significant increase in newborn serum crude protein concentration was observed when their dams (dairy heifers) were fed on YC dietary supplementation (Fröhdeová *et al*., 2014). This increase in newborn serum was correlated with high immunoglobulines concentration and good healthy condition of animals in our study as previously reported by Tóthová *et al.* (2014).

Concentration of some biochemicals in blood serum of calves:

Data in Table (4) revealed significant (P<0.001) effect of dam parity on concentration of total lipids (TL) and cholesterol (CH) in blood serum of calves, being higher in heifers than in cows. However, glucose (GL) and creatinine (CR) concentrations were not affected by dam parity. As affected by YC treatment of dam, calves of dams in T3 showed significantly (P<0.05) the highest concentration of TL, CH and GL and the lowest concentration of CR, while T1 showed opposite trends (Table 4). Such finding indicated that treatment of dams with YC at high level (40 g/h) resulted in marked alteration in lipid and protein metabolites in blood of their calves.

Table 3. Mean and standard error of total proteins and their fraction in blood serum of calves as affected by dam parity, YC treatment, post-calving day and their interactions.

Item	Blood total proteins and their fraction (mg/dl)		
	Total proteins	Albumin	Globulin
Effect of dam parity (P):			
Heifers (H)	7.30±0.20	4.38±0.12	2.92±0.14
Cows (C)	7.38±0.19	4.47±0.10	2.91±0.15
Effect of YC treatment (T):			
T1 (control)	6.58±0.18^b	3.97±0.10^b	2.60±0.15^b
T2 (20 g YC)	7.10±0.23^b	4.26±0.12^b	2.85±0.17^b
T3 (40 g YC)	8.34±0.19^a	5.04±0.11^a	3.30±0.19^a
Effect of post-calving week:			
0 wk	8.12±0.23^a	4.19±0.12	3.93±0.15^a
4 wk	6.90±0.30^b	4.39±0.20	2.51±0.17^c
8 wk	6.53±0.32^b	4.32±0.25	2.21±0.13^c
12 wk	7.17±0.30^b	4.61±0.14	2.57±0.23^c
15 wk	7.97±0.25^a	4.60±0.13	3.36±0.18^b
Interactions:			
P x T	P<0.91	P<0.72	P<0.99
P x W	P<0.93	P<0.76	P<0.62
T x W	P<0.99	P<0.99	P<0.97
P x T x W	P<0.99	P<0.43	P<0.74

Means denoted within the same column for each factor with different superscripts are significantly different at P<0.05.

Also, the effect of sampling week on concentration of TL, CH, GL and CR was significant (P<0.05). Concentration of TL and CH showed significant (P<0.05) decrease during the 1st four weeks, then gradually increased up to 15 wk of age. However, concentration of GL and CR showed gradual reduction from birth up to 15 wk of age (Table 4).

Increasing TL concentration in calf serum of dams in T3 may be explained by the relationship between availability of easily digestible components in the colostrum and in whole milk and the high lipid content in blood serum of calves (Strusinka *et al*., 1998). The observed increase in GL concentration in calf serum of T3 may be attributed to the increase in GL concentration in dairy cows fed diet containing YC, which may be related to a reasonable improvement in gluconeogenesis and increased lactose absorption (De Valdez *et al*., 1997). In agreement with these results, Mohri *et al.* (2007) indicated decrease in creatinine levels of Holstein calves from calving day to the 70th day of age.

Table 4. Mean and standard error of some blood serum biochemicals of calves as affected by dam parity, YC treatment, post-calving week and their interactions.

Item	Blood biochemical (mg/dl)			
	Total lipids	Cholesterol	Glucose	Creatinine
Effect of dam parity (P):				
Heifers (H)	613.98±5.37^a	113.19±2.78^a	85.05±2.40	1.37±0.06
Cows (C)	600.86±6.29^b	107.49±2.60^b	81.91±1.88	1.28±0.05
Effect of YC treatment (T):				
T1 (control	577.68±6.07^c	96.64±2.63^c	74.15±1.59^b	1.53±0.06^a
T2 (20 g	607.04±5.05^b	109.70±2.61^b	78.96±2.09^b	1.32±0.04^b
T3 (40 YC)	637.55±5.99^a	124.67±2.56^a	97.33±2.06^a	1.12±0.05^c
Effect of post-calving week (W):				
0 wk	635.83±6.96^a	111.43±4.00^b	90.25±3.73^a	1.53±0.09^a
4 wk	575.52±8.92^c	96.71±3.91^c	85.11±3.48^{ab}	1.44±0.07^{ab}
8 wk	582.01±5.61^c	106.30±3.16^b	81.48±3.15^{bc}	1.39±0.08^{ab}
12 wk	610.93±6.52^b	111.78±3.98^b	76.29±3.01^c	1.24±0.07^b
15 wk	632.81±8.32^a	125.48±3.65^a	84.27±3.14^{ab}	1.02±0.04^c
Interactions:				
P x T	P<0.51	P<0.85	P<0.29	P<0.97
P x W	P<0.74	P<0.99	P<0.53	P<0.95
T x W	P<0.02*	P<0.89	P<0.99	P<0.93
P x T x W	P<0.99	P<0.99	P<0.99	P<0.99

Means denoted within the same column for each factor with different superscripts are significantly different at P<0.05.

It is of interest to note that only the interaction effect between treatment and sampling week on total lipids concentration in serum of calves was significant (P<0.05), reflecting similar trend of change in TL concentration by advancing age, being almost higher in T3, moderate in T2 and the lowest in T1 (Fig. 1).

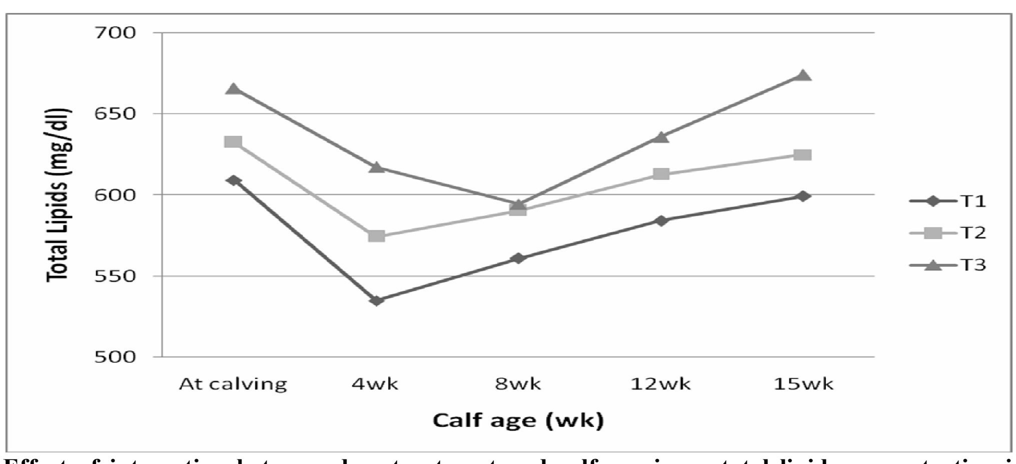

Fig. 1. Effect of interaction between dam treatment and calf age in on total lipids concentration in blood serum of calves.

Enzyme activity (AST and ALT) and thyroid hormone in blood serum of calves:

Results in Table (5) showed insignificant difference in ALT activity and significant (P<0.05) increase in AST activity in heifers than in cows. However, activity of both AST and ALT was significantly (P<0.05) the lowest in blood of calves of dams in T3. This reduction in transaminases activity may be associated with normal liver function of T3 calves. As affected by calf age, ALT activity significantly (P<0.05) decreased from birth up to 14 wk of age, then significantly (P<0.05) increased at 15 wk of age, while AST activity showed an opposite trend with age advancing. It is worthy noting that all interaction effects were not significant on AST and ALT activity.

Results revealed insignificant effect of dam parity on serum T_3 concentration in calves. However, T_3 concentration was significantly (P<0.05) lower in T2 and T3 than in T1, indicating a reduction in thyroid hormone (T_3) as affected by dam treatment with YC. By advancing calf age, T_3 concentration in calf serum showed significant (P<0.05) increase only at 15 wk of age (Table 5). Only the effect of interaction between dam parity and YC treatment on T_3 concentration was significant (P<0.05). Concentration of T_3 was almost lower in both treatment groups (T2 and T3) than in control (T1), regardless dam parity (Fig. 2). In according to the present results in term of a relationship between AST and ALT activity in calf blood and feeding milk type, Hammon and Blum (1998) reported that the activity of AST increased on the second day after birth of calves fed only milk replacer instead of colostrum.

Table 5. Mean and standard error of some enzyme activity in blood serum of calves as affected by dam parity, YC treatment, post-calving week and their interactions.

Item	ALT (IU/L)	AST (IU/L)	T_3 (nmol/L)
Effect of dam parity:			
Heifers (H)	13.09±0.25	32.31±0.73[a]	2.40±0.06
Cows (C)	13.17±0.24	30.42±0.62[b]	2.34±0.08
Effect of YC treatment (T):			
T1 (control)	14.55±0.25[a]	34.60±0.79[a]	2.81±0.05[a]
T2 (20 g YC)	12.73±0.22[b]	31.44±0.73[b]	2.15±0.06[b]
T3 (40 g YC)	12.11±0.23[c]	28.08±0.53[c]	2.17±0.07[b]
Effect of post-calving week (W):			
0 wk	14.32±0.39[a]	29.86±1.08[c]	2.36±0.12[b]
4 wk	12.50±0.24[b]	28.63±0.79[c]	2.33±0.09[b]
8 wk	12.42±0.27[b]	30.19±0.80[c]	2.29±0.10[b]
12 wk	12.56±0.29[b]	32.49±0.94[b]	2.28±0.11[b]
15 wk	13.85±0.48[a]	35.68±1.01[a]	2.59±0.10[a]
Interactions:			
P x T	P<0.79	P<0.19	P<0.05*
P x W	P<0.16	P<0.22	P<0.85
T x W	P<0.35	P<0.60	P<0.55
P x T x W	P<0.99	P<0.93	P<0.99

Means denoted within the same column for each factor with different superscripts are significantly different at P<0.05.

In General, the improvement in blood biochemicals as affected by dam yeast culture treatment in this study was in agreement with Ghoneem and Mahmoud (2014) working on growing lamb treated with in-activated yeast and Fröhdeová *et al.* (2014) working on dairy calves fed YC supplementation.

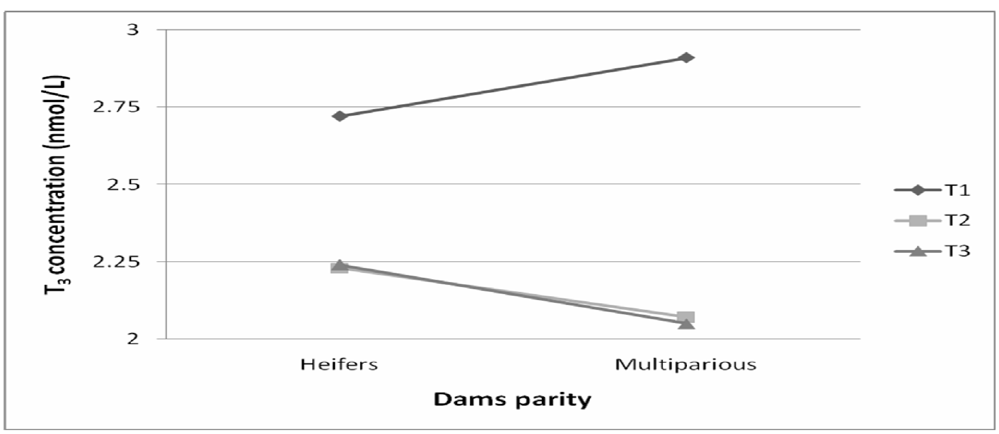

Fig 2. Effect of interaction between dam parity and treatment on concentration of T_3 in blood serum of calves.

CONCLUSION

The current study may conclude that pre- and post-partum yeast culture treatment at a level of 40 g/h/day for heifers and cows is able to enhance their newborn immunity response and improve calf performance with good health status, which allow for raising good male calves of breeding or female calves of milk production.

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الاستجابة المناعية وكفاءة المواليد الناتجة من أبقار الموسم الأول ومتعددة المواسم المغذاة على بيئة الخميرة

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أجريت هذه الدراسة لتقييم تأثير إضافة بيئة الخميرة (YC) للأبقار الحلابة على نقل المناعة إلى العجول المولودة منها خلال الأيام الأولى من العمر و أدائها فيما بعد. استخدم فى هذة الدراسه خمسة عشر بقرة فريزيان متعددة المواسم (٢-٤ موسم بوزن ٥٠٠ -٥٢٠ كيلوجرام) وخمسة عشر عجلة فريزيان موسم أول (بمتوسط وزن ٤٢٠-٤٠٧ كيلوجرام) في مرحلة متأخرة من الحمل (حوالي ٩٠ يوما قبل الولادة) تم توزيعها إلى مجاميع تجريبيه: (T1) بها ٥ أبقار موسم أول و ٥ أبقار متعددة المواسم بدون أي إضافات و(T2) ويضاف لها ٢٠ جم/ رأس يوميا من بيئة الخميرة غير النشطة و(T3) ويضاف لها ٤٠ جم/ رأس يوميا من بيئة الخميرة غير النشطة واستمرت المعامله لمدة ٩٠ يوم بعد الولاده. تم إرضاع العجول السرسوب من الأمهات لمدة ٣ أيام متتالية، جمعت عينات الدم من المواليد عبر الوريد الودجي في الأيام الأول والثاني والثالث بعد الولادة لتقدير تركيز الجلوبيولينات المناعيه وبعد ذلك في الأسبوع ٤ و ٨ و ١٢ و ١٥ من عمر العجول لتقدير عدد كرات الدم الحمراء والبيضاء وتركيزالهيموجلوبين والهيماتوكريت وتم تقدير تركيز كل من اليروتينات الكليه والأليومين والجلوبيولين والدهون الكلية والكوليستيرول والجلوكوز والكرياتينين وهرمون الثيرويد (T_3) ونشاط انزيمي AST وALT. أظهرت النتائج المتحصل عليها ميلى: ١- عدم وجود تأثير معنوي لعدد موسم الولادة للأمهات (أبقار وعجلات) على تركيز الجلوبيولينات المناعية للعجول٢- كان تركيز الجلوبيولينات (IgG,IgM,IgA) في المجموعة (T3) أعلى بمقدار ٣٢ و ٨١ و ١١٢٪ مقارنة بالمجموعة (T1). ٣- زاد عدد كرات الدم الحمراء معنويا في الأبقار متعددة المواسم مقارنة بأبقار الموسم الأول بينما لم يؤثر عدد المواسم على عدد كرات الدم البيضاء أو الهيموجلوبين أو الهيماتوكريت.٤- زادت القياسات الهيموتولوجية في المجموعة المعاملة (T3) بالمقارنة مع المجموعة غير المعاملة (T1).٥- لم يؤثر عدد المواسم على تركيز البروتينات الكليه ومكوناتها بينما كانت الأعلى في المجموعة المعاملة (T3) مقارنة بكل من (T2) و (T1). ٦- كان تركيز الدهون الكلية والكوليستيرول أعلى معنويا في مواليد أبقار الموسم الأول مقارنة بمتعددة المواسم.٧- لم يؤثر عدد الموسم للأمهات على تركيز الجلوكوز والكيرياتينين. ٨- أظهرت مواليد المجموعة المعاملة (T3) أعلى تركيز معنوي للدهون الكلية والكوليستيرول والجلوكوز والأقل للكيرياتينين بينما أظهرت المجموعة (T1) معدلات عكسية.٩- زاد النشاط الانزيمي لـ(AST) في عجول أبقار الموسم الأول مقارنة بمتعددة المواسم. ١٠- كان النشاط الانزيمي لكل من (AST,ALT) الأقل معنويا في (T3). ١١- انخفض مستوى هرمون الثيرويد T_3 في عجول الأمهات المضاف لها بيئة الخميرة في (T2,T3) مقارنة بـ (T1).هذة الدراسة يمكن أن توصي بأن إضافة بيئة الخميرة إلى الأمهات والعجلات الحلابة قبل وبعد الولادة بمعدل ٤٠جم/رأس/يوم من الحمل يمكن أن تساعد جهاز المناعة للعجول حديثة الولادة ويحسن أدائها مع وضع صحي جيد.