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EFFECT OF LONG CHAIN FATTYACIDS ON THE PRODUCTION AND REPRODUCTIVE IMMUNITY OF HOLSTEIN DAIRY COWS

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SUMMARY

Twenty two multiparous and primiparous Holstein cows were utilized in a completely randomized design to determine the effects of feeding diets containing health, immunity, reproductive responses of heat stressed cows during the transition period. Dietary treatments were initiated 20-35 d prior to estimate calving date and continued till confirmed pregnancy postpartum. Diets were formulated to be isocaloric and isonitrogenous and started feeding the pre calving diets at July for the precalving cows and the post calving diets were fed tell conception. Dry matter intake (DMI) was measured and recorded , the average 1 three months postpartum milk production were calculated. Total mixed ration (TMR) ration were collected monthly , and analyzed. Milk samples were collected for analysis and measuring beta hydroxy buterate (BHB), lysozy me and nitric oxide concentration .The obtained results showed no difference in the average DMI between the two group sin pre calving stage (12.5for G1;12.4 for G2,Kg/h/d),while, it was higher in theG1(20.55) than in G2 (18.45) in the 1st three month post calving. Milk production was increased in G1(36.42±0.14kg)than in G2 (34.57±0.20kg) but they are not significantly different. Also there was no significant difference between the two groups in milk analysis for protein, fat, SNF, and lactose at W2, W4 and at W7 postpartum. BHB concentration at W2 PP was significantly lower in G1 (25±9.45µg/mol.) than those in G2 (81.25±9.15µg/mol.) , lysozyme at w2, w4 and w7 PP was significantly decreased in G1(94.10±30.73,45.56±9.86,26.15±11.12µg/ml) than those in G2 (246.34±6.11, 217.21±9.56, 192.68±11.048µg/ml) respectively. Nitric oxide concentration was significantly decreased in G1 (47.38±18.21, 18.43±3.45, 14.27±2.72 µm/ml) than those in G2 (91.79±9.55, 64.73±7.40, 42.53±6.31µm/ml) at W2,W4 and W7, respectively. Uterine cytology (neutrophil concentration) at day40±3PP was higher in G2 than G1 but they were not significantly different. Days to1st estrus and days to1st insemination were significantly lower in group one (36.92±0.52, 75.0793±0.68) than those in G2 (86.18±0.64, 88.94±0.53) respectively. Days open and I.N. in G1 (172.89±3.13, 3.19±0.06) were lower than those in G2(195.42±2.78,4.07±0.07) but they were not significantly different. Conception rate(CR%) at1st, 2nd and 3rdinsemination was higher in G1 (10%,50%,20%) than those in G2(8.33%,25%,8.33%) and also repeat breeder (%) was much greater in G2(58.33%) than in G1 (30%). This study concluded that, using omega-3FA may enhance there productive performance of dairy cows during summer season because of its anti-inflammatory potency, leading to a higher chance of survival of the embryo when supplemented during the per conceptual period by reducing the oxidative stress.

Keywords: *omega* ***3****, omega* ***6****, immunity, heat stress, reproductive performance*.

INTRODUCTION

Recent research has shown that Fatty acids (FAs) may modulate immune responses in several species including cows. Addition of FAs to dairy cow diets has become common practice in an effort to increase the energy density of the diet to prevent the state of negative energy balance (NEB)that usually accompanies the transition period of these animals. Development of new feeding strategies in which dietary fats influence the immune responses through the modulation of pro-inflammatory factors could contribute to attenuation of the immune suppressive in dairy farms due to heat stress effect caused by parturition, through improving immune functions involved in defense against pathogenic organisms (Lessard*et al.*, 2004). It is important to understand how different FAs modulate immune responses in dairy cows, in order to determine which fat is omers may be efficaciousin improving the immunologic aldys function that is associated with the transition period. So we can increase the amount of milk production and enhance the reproductive performance by improving reproductive tract immunity and decreasing stress and inflammatory media to postpartum especially during the summer season in Egypt which cause hugelosses. The objective of this study to determine the effects of feeding diets containing linseed or cotton seed as sources of n-3 or n-6 FAs on production ,uterine health, immunity, metabolic and reproductive responses of heat stressed cows during the transition period at hot season.

MATERIALSAND METHODS

***Cows and Diets**:* Twenty two multiparous and primiparous (1-3parity) Holstein cows were utilized in completely randomized design to determine the effects of feeding diets containing linseed or cotton seed as sources of n-3 or n-6 FAs on production, uterine health, immunity, metabolic and reproductive responses of heat stressed cows during the transition period at hot season. A total of twenty-two multiparous cows were used for statistical analyses. Animals that were diagnosed with any condition that required administering antibiotics either pre-or postpartum were removed from the trial. The experiment was conducted at Egyptian farm (Elbaramoth dairy farm in El-natroon valley), cows was started feeding the pre calving diet at July and then fed post calving diets tell conception. The two dietary treatments were initiated 28-35d prior to estimate calving date and continued tell conception.The1group diet contained linseed while the 2nd group (G2,12cows) fed diet contained Casoap fat (palm oil fat origin) supplement and cottonseed who lelent. Diets were isocaloric and isonitrogenous. (Table 1).

Fat supplements and oilseeds were mixed with the concentrates and offered as apart of the total mixed ration (TMR) to experimental animals. The experimental diets were formulated to me*et al*l the nutritional requirements according to (NRC2001).Cows were fed diets for ad libitum consumption and given ad libitum access to water. Pre and postpartum cows were housed in a free -stall; sand-bed dedbarn euipped with fans, sprinklers. Intake of DM was measured daily by subtracting the refusal from the total amount offered. All experimental cows were offered *adlibitum* amounts of TMR to allow for 3-5% refusals. Feed refusal collected each early morning and weighed.TMR ration were collected on ce pre calving and monthly post calving ,and analyzed by wet chemistry for fat (acidhy drolysis), crude protein (CP), acid-detergent fiber(ADF), and neutral-detergent fiber (NDF). Detailed ingredients and chemical composition of the experimental diets are listedinTable (1). Post partum cows were milked three times perday and milk amount for each cow were recorded at each milking. For each experimental cow, samples of milk from consecutive early morning and after noon and evening milking were collected at the same day in weeks 2, and7 postpartum for analysis.

Bodyweight and feed consumption: Nutrients requirements were calculated on body weight basis and milk yield according to NRC (2001) .The average dry matter intake (DMI) per head per day was measured and recorded for each group pre and post calving till 3month postpartum.

Analysis of dietary nutrients content : Dry samples from the experimented rations were ground with a Wiley mill(2-mmscreen). Feed samples were analyzed for ether extract and crude protein according to A.O.A.C.(2012). NDF and ADF were determined according to Goering and Van Soest (1991).

Milk production and collection: Individual milk yield was recorded daily for three months post calving. Milk samples were collected from each group at W2,W4 and at W7post-partum, and analyzed for milk fat, protein, solids-not-fat and lactose using Milko-ScanFT6000.Also samples were analyzed for beta hydroxyl butyrate(BHB)using acommercially available test(Carrier*et al.*,2004), lysozyme (Schultz*et al.*,1987) and nitric oxide measurement (Rajaraman*et al.*,1998).

Statistical analyses: The various data were subjected to ANOVA Analysis of variance by Duncan "stest according to difference was applied to the data to test for differences between treatments using a computer (*P*<0.05).

Uterine Health. An assessment of uterine cytology was conducted for each animal at 40±3DIM (Sheldon *et al.*, 2006). Cows were flushed using a53.3silicon Foley catheter. The vulva was cleaned with a10% chlorhexidine di acetate solution and dried with a paper towel. The catheter was introduced through the cervix into the previously pregnant uterine horn. The air balloon was placed approximately1cmpast the bifurcation of the uterine horn and inflated to a volume consistent with the size of the uterine horn. Steriles aline (20mLof0.9%)was infused into the uterine horn and aspirated back using a syringe with a Foley connector .The aspirated solution was placed intoasterile50-mLconicaltube and vortexes.

A10micro.Lsample of the solution was smeared onto aglasss lide and allow to air dry. The smear was stained using the Protocol Hema 3 stain method. Slides were examinedatamagnificationof40xwithoil immersion and 100 total cells (including en do the lial cells) were counted. Percent of neutrophils were calculated as follows: *% neutrophils = total number of neutrophils / 100*

Table (1): Composition of the pre and post calving experimented diets (As-fed basis)

Ration	G1		G2	
Feed Stuff(Kg/h/d)	Pre calving	calving	Pre calving	Post calving
CornGrain,Ground, Dry	2.57	7	2.5	7.5
Linseed	0.73	2		
Soybean, Meal,Solv,47%protein	1.1	3	1.18	3.5
Wheat bran			0.25	0.75
Cottonseed,Whole with lint	-	-	0.85	2.5
Calciumsoaps offattyacids	-	-	0.12	0.36
Corn silage	25	16	25	15
Alfa Alfa hay	-	6	-	5.5
Rice straw	0.5		0.5	
Magnesiumoxide	0.01	0.02	0.01	0.02
SodiumBicarbonate	0.05	0.16	0.05	0.17
Mono-basic calciumphosphate	0.03	0.07	0.02	0.07
Premix[1]	0.04	0.02	0.04	0.02
NEWT-NIL®Dry[2]	0.015	0.01	0.015	0.01
CP	13.1	17.8	13.1	17.8
NEL (M Cal/kgDM)		1.70		1.70
NDF (%DM)	35	28.1	36.1	28.6
ADF (%DM)	21.1	18	22.6	19.4
Forage NDF (%DM)	28.7	19.1	28.7	17.6
R:C ratio		44:56		40:60
TDN (%DM)	74	76	74	76
E.E (%DM)	5.1	5.7	5.2	6.1

1=(Vit. A10000000IU, Vit D32500000 IU, Vit.E 35000mg , Biotin 1000mg, Zinc100000mg,Mn 80000mg,Cu 30000 mg,I 800mg,Co 400mg, Se 300mg, Caco3 to 3kg).2=Sorbicacid0.05%, Citricacid0.75%,Calcium propionate10.5%, Copper sulphate5%, Inactivated yeast(Saccharomyces Cerevisiae) 2%,Sapiolite 41.7%, Bentonite 40%.

Water mineral analysis was taken inconsideration in ration calculation. According to the official methods of A.O.A.C. (2012). NEL (net energy for lactation), NDF (neutral detergent fiber), ADF (acid detergent fiber),TDN (total digestible nutrients), R:C ratio (roughage concentrate ratio), E.E (ether extract).

RESULTS AND DISCUSSION

The obtained results showed no difference in DMI between the two groups in the pre calving stage (12.5forG1;12.4forG2), while, the average three month DMI postpartum was higher in the G1(20.55) than in G2(18.45) (Table 2). G2 in the 1st three months post calving.

The low DMI in both group was due to the heat stress which affect feed consumption during hot season ,that effect was lower in G1 may be due to the anti-inflammatory effect of using omega3 in G1 ration (Amaral*et al.*,2008). Also the decrease in DMI inG2 can is explained by the higher rumen degradation and lower fat protection of cottonseed than linseed as a source of protected fat. As factors that determine if a reduction in DMI will occur due to FA supplement action inclued the degree of ruminal protection of the FA supplement and the amount of fiber fed in the diet. The depression in DMI due to fat feeding is due, in part ,to a reduction of fiber digestion leading to prolonged ruminal fill, and decreased palatability attributed to fat supplements (Allen, 2000).

Milk production constituents There was no significant difference in the first three months average milk production (M.P)/cow/day between the two experimented groups (Table2),although it was higher in G1(36.42±0.14)than in G2(34.57±0.20), this non-significance may be due to the low cow number in each group. An increase in milk production may be due to higher bypass protein supplied from linseed diet and lower stress due to the anti-inflammatory effect of omega3 in G1(Amaral *et al.,* 2008). The present results indicated that G2 recorded the higher values of milk fat% atweek(W2,W4andW7) than those of G1.While, G1 recorded the higher values of milk protein and solidnotfat(SNF) at week (W2 and W4) than those of G2 But, there was no significant difference between the two groups .

Table (2): Effect of the experimented diets on the DMI (kg), average milk production (kg) and milk constituents.

Parameter	G1 (Mean±SE)	G2 (Mean±SE)	Sig.
Pre-calving DMI	12.5	12.4	-
Post-calving DMI	20.55	18.45	-
Milk production. (kg)	36.42±0.14	34.57±0.20	0.33
Milk composition: Fat %			
W2	3.55±0.35	4.29±0.30	0.15
W4	3.03±0.12	3.36±0.36	0.31
W7	3.42±0.20	3.66±0.30	0.50
Protein (%)			
W2	4.03±0.13	3.69±0.33	0.49
W4	3.96±0.11	3.84±0.11	0.49
W7	3.73±0.09	3.97±0.11	0.13
SNF (%)			
W2	11.13±0.34	9.61±1.10	0.14
W4	10.93±0.27	10.59±0.29	0.43
W7	10.28±0.25	10.93±0.30	0.13
Lactose(%)			
W2	6.09±0.19	6.08±0.65	0.98
W4	5.97±0.15	5.80±0.16	0.49
W7	5.60±0.14	5.96±0.16	0.14

There was a significant difference ($P<0.01$) between BHB concentration in w2 postpartum (PP) in G1(25±9.45) than those in G2(81.25±9.15). Lysozyme in G1 (94.10±30.73,45.56±9.86,26.15±11.12)was significantly ($P<0.01$) decreased compared to G2(246.34±6.11,217.21±9.56,192.68±11.048)at w2, w4 and w7, respectively. Also nitric oxide concentration was significantly ($P<0.01$) lower in G1 (47.38±18.21, 18.43±3.45, 14.27±2.72) than those in G2 (91.79±9.55 ,64.73±7.40,42.53±6.31) atW2, W4 and W7, respectively. While uterine wash neutrophil concentration at day40±3was higher in G2 than G1 but the difference between the two groups was non-significantly different.

Current study results revealed that there was a significant difference between BHB in the w2 postpartum (PP) in G1 than those inG2. The difference between the two groups may be due to higher feed intake postpartum and better energy efficiency. As shown in table 3, lysozyme at w2, w4 and w7 PP in G1 was significantly decreased than those in G2. Also its concentration was decreased by increasing days in milk postpartum, these results coincide with those reported by Pizato *et al.* (2006) and Calder, (2007) who found an effects of n-3F as on cells of the in nateimmune system explain why these FAs are consider edimmuno suppressive while, That cher *et al.*(2006) stated that the increased linoleic acid (LA) in tissues likely enhanced the immuno competence of the animals postpartum due to increased PG production. Also nitric oxide concentration was significantly lower in G1 than those in G2 at W2 , W4 and W7 respectively, and its concentration decreased by increasing lactation days.

These results can be explained by That cher *et al.* (2006) who reported that feeding Omega-6 FA was believed to have pro inflammatory and thus PGF2α-stimulating properties rendering them extra value as“ neutraceutical” early postpartum. But it also may cause immune failure during vaccination and disease infection because of high stress load and duration like incase of heat stress in summer. While, Amaral *et al.* (2008) reported that omega-3FFA can weaken this inflammatory potency. Nitric oxide (NO) is one of the most important reactive nitrogen intermediates, which operates in a variety of tissues to regulate a diverse range of physiological processes such as inflammatory response (Dawson and Dawson,1995).Activation of inflammatory and immune responses leads to an increase in cytokines production, which in turn can increase secretion of other molecules such as PGF2 or nitric oxide (Hansen *et al.*,2004). The decreased concentration of nitric oxide and lysozyme by increasing days in milk(DIM) postpartum can be explained as feed intake increased, which decrease the effect of negative energy balance post-partum ,as cows postpartum were metabolically challenged as energy demands outstrip energy intake, and animal senter a state of negative energy balance (Ingvartsen and Andersen, 2000). This triggers mainly catabolic path ways which, at the cellular level, increase the production of" reactive oxygen metabolites"(ROMs)(Bernabucci *et al.*,2005). This (ROMs) production decreased by decreasing DIM and increasing feed intake PP. Also their concentrations were positively affected with increased milk production; cows with high milk yields have higher concentrations of oxidative stress than lower yielding animals (Lohrke *et al.*,2004; Castillo *et al.*, 2006). Uterine wash neutrophil concentration at day40±3was higher in G2 than G1 but the difference between the two group was no significantly different, these results support the results reported by Amaral *et al.*(2008) who found that primiparous dairy cows fed a diet rich in n-3F As had lower neutrophil counts in uterine flush ings collected at 40±2days postpartum compared to those animals fed adiet rich in saturated and n-6F As, suggesting that the animals fed the n-3 supplement had healthier uterine environments .

Table (3): Effect of the experimented diets on BHB, oxidative stress biomarkers and uterine cytology in heat stressed dairy cows" milk.

Parameters	G1 (Mean±SE)	G2 (Mean±SE)	P
	BHB1 (µ g/mol)		
BHB1(W2)	25±9.45	81.25±9.15	0.001
BHB2(W7)	50±8.33	61.11±7.35	0.240
Lysozyme (µg/ml)			
W2	94.10±30.73	246.34±6.11	0.000
W4	45.56±9.86	217.21±9.56	0.000
W7	26.15±11.12	192.68±11.048	0.000
Nitric oxideconcentration (µm/ml)			
W2	47.38±18.21	91.79±9.55	0.01
W4	18.43±3.45	64.73±7.40	0.000
W7	14.27±2.72	42.53±6.31	0.005
Uterine cytology	1.50±0.62	3.67±2.30	0.354

Reproductive parameters

Days to 1 estrus and days to 1 insemination were significantly lower in group one (36.92±0.52, (10%, 50%,75.0793±0.68) than those in G2 (86.18±0.64, 25%,8.33%), 88.94±0.53respectively).Days open(D.O)and higher in insemination no(I.N)in G1(172.89±3.13, 3.19±0.06)(Table4) were decreased than those in G2 (195.42±2.78, 4.07±0.07respectively)although they were not significantly different. Conception rate (CR%) at1,2nd and 3rd insemination was higher in G1 (10%, 50%, 20%)than those in G2 (8.33%, 25%, 8.33%), Mean while ,repeat breeder (%)was much higher in G2(58.33%)than in G1(30%) asseen in Table (4). The lower reproductive parameters in this study may be due to heat stress as the experiments tart at summer. Heat stress has been suggested to affect oxidative status in dairy cows which can affect reproductive and productive performances. Evidence suggests that the effects of elevated temperatures on embryonic development involve changes in the metabolism of free radicals. Heat shock increases intracellular ROMs in cultured bovine embryos , which in turned laysor blocks embryo development (Sakatani *et al.*,2008). Activation of inflammatory and immune responses leads to an increase in cytokines production, which in turn can increase secretion of other molecules detrimental for embryo survival and development, such as PGF2 or nitric oxide (Hansen*et al.*,2004).Oxidative stress can affect reproductive events through reactive nitrogen species like nitric oxide (Rosselli*et al.*,1998). An endogenous nitric oxide system exists in the fallopian tubes (Rosselli*et al.*,1996).Increased nitric oxide levels in the fallopian tubes are cyto toxic to the invading microbes and also may be toxic to spermatozoa (Rosselli *et al.*,1995). In addition ,nitric oxide might participate in the regulation of uterine contraction (Norman *et al.*,1999). This can result in decreased transport of sperm to ova or retained placenta (Miller *et al.*,1993). The enhancement of reproductive performance in the G1 may be due to feeding omega3 which has anti-inflammatory effect and decrease the oxidative stress and signs of inflammation around conception especially during summer, while feeding n-6F A to dairy cows has a pro inflammatory effect and stimulates PGF2-α synthesis (Petit*et al.*,2004).A sequential and selective feeding of extran-6FAaroundcalvingandofn-3 rich diets during the breeding period has there fore been proposed as an optimal reproductive management strategy in dairy cows (Silvestre*et al.*,2011). The optimal immune response at the uterine level early postpartum should prevent endometritis while then-3 supplementations around conception should safeguard embryo survival through sustained corpus luteumfunction.

Table (4): Effect of the experimented diets on reproductive performance of dairy cows.

Parameter	G1	G2	Sig.
	Mean±SE	Mean±SE	
Days to 1st IN.	75.0793±0.68	88.94±0.53	0.041
Daysto1st estrus	36.92±0.52	86.18±0.64	0.000
D.O	172.89±3.13	195.42±2.78	0.362
I.N	3.19±0.06	4.07±0.07	0.156
CR at 1stinsem.	10	8.33	
CR at 2stinsem.	50	25	
CR at 3rd insem.	20	8.33	

CONCLUSION

It can be concluded that, the amount of milk production and there productive performance may be enhanced by improving reproductive tract immunity and decrease stress and inflammatory mediators postpartum especially during the summer season in Egypt which cause huge losses in dairy farms due to heats tress .Using Omega-3F A sources in dairy cow ration can weaken the inflammatory potency, leading to a higher chance of survival of the embryo when supplemented during the per conceptual period.

REFERENCES

A.O.A.C. (2012): Official Methods of Analysis of AOAC International- 19 th Edition, 2012. Association of Analytical ``Q1 Chemists, Washington, DC.

Allen, M.S. (2000): Effects of diet on short-term regulation of feed intake by lactating dairy cattle. J. Dairy Sci.; 83: 1598-1624.

Amaral, B.C.; C.R. Staples; O.S. Filho; T.R. Bilby; J. Block; F. Silvestre; F.M. Cullens; P.J. Hansen and W.W. Thatcher (2008): Effect of supplemental fat source on production, Immunity, and reproduction of peri parturient Holstein cows in summer. J. Dairy Sci. 88 (Suppl. 1): 178.

Bernabucci, U.; B. Ronchi; N. Lacetera (2005): Influence of body condition score on relationships between metabolic status and oxidative stress in pre parturient dairy cows. J. Dairy Sci., 88: 2017-2026

Calder, P.C. (2007): Immuno modulation by omega-3 fatty acids. Prostaglandins Leukot Essent Fatty Acids. 77: 327-35.

Carrier, J.; S. Stewart; S. Godden; J. Fetrow and P. Rapnicki (2004): Evaluation and use of three cows ide tests for detection of sub clinical ketosis in early postpartum cows. J. Dairy Sci., 87: 3725-3735.

Castillo, C.; J. Hernandez and I. Valverde (2006): Plasma malonaldehyde (MDA) and total antioxidant status (TAS) during lactation in dairy cows. Research in Veterinary Science, 80: 133-139.

Dawson, T.M. and V.L. Dawson (1995): Nitric oxide: actions and pathological roles. Neuroscientist, 1: 7-18.

Goering, H.K. and P.J. Van Soest (1991): Methods for Dietary Fiber, Neutral Detergent Fiber, and Non starch poly saccharides in Relation to Animal Nutrition. Journal of dairy science, 302 (91): 78551-2.

Hansen, P.J.; P. Soto and R.P. Natzke (2004): Mastitis and fertility in cattle–possible involvement of inflammation or immune activation in embryonic mortality. American Journal of Reproductive Immunology, 51: 294-301.

Ingvartsen, K.L. and J.B. Andersen (2000): Integration of metabolism and intake regulation: a review focusing on peri parturient animals. Journal of Dairy Science, 83: 1573-1597.

Lessard, M.; N. Gagnon; D.L. Godson and H.V. Petit (2004): Influence of parturition and diets enriched in n-3 orn-6 poly unsaturated fatty acids on immune response of dairy cows during the transition period. J. Dairy Sci.; 87: 2197-210.

Lohrke, B. ; T. Viergutz and W. Kanitz (2004): High milk yield in dairy cows associated with oxidant stress. Online Journal of Veterinary Research, 8: 70-78.

Miller, J.K.; E. Brzezinska-Slebodzinska and F.C. Madsen (1993): Oxidative stress, antioxidants, and animal function. Journal of Dairy Science, 76: 2812-2823.

Norman, J.E.; A.J. Thomson and J.F. Telfer (1999): Myometrial constitutive nitric oxide synthase expression is increased during human pregnancy. Molecular Human Reproduction,

NRC (2001): Nutrient requirements of dairy cattle, 7 rev.ed. Natl Acad Sci. Washington, DC.

Petit, H. V.; C. Germiquet and D. Lebel (2004): Effect of feeding whole, unprocessed sunflower seeds and flax seed on milk production, milk composition, and prostaglandin secretion in dairy cows. J. Dairy Sci., 87: 3889-3898.

Pizato, N.; S. Bonatto; M. Piconcelli; L.M. DeSouza; G. L. Sassaki; K. Naliwaiko; E. A. Nunes; R. Curi; P. C. Calder and L. C. Fernandes (2006): Fish oil alters T-lymphocyte proliferation and macrophage responses in Walker 256 tumor-bearing rats. Nutrition; 22: 425-32.

Rajaraman, V.; B.J. Nonnecke; S.T. Franklin; D.C. Hammell and R.L. Horest (1998): "Effect of vitamins A and E co n nitric oxide production by blood mono nuclear leukocytes from neonatal calves fed milk replacer. "J. Dairy Sci., 81:3278-3285.

Rosselli, M.; R. Dubey and B. Imthurn (1995): Effects of nitric oxide on human spermatozoa: evidence that nitric oxide decreases sperm motility and induces sperm toxicity. Human Reproduction, 10: 1786-1790.

Rosselli, M.; R. Dubey and M. Rosselli (1996): Identification of nitric oxide synthase in human and bovine oviduct. Molecular Human Reproduction, 2: 607-612.

Rosselli, M.; P. Keller and R. Dubey (1998): Role of nitric oxide in the biology, physiology and pathophy sinology of reproduction. Human Reproduction Update,4: 3-24.

Sakatani, M.; K. Yamanaka and S. Kobayashi (2008): Heat shock-derived reactive oxygen species induce embryonic mortality in vitro early stage bovine embryos. Journal of Reproduction and Development, 54:496-501.

Schultz, L.A. (1987): Lysozyme. In: Methods in clinical Chemistry. A.J. Pesce and L.A. Kaplan, (Eds). St. Louis: Mosby,pp 742-746.

Sheldon, I.M.; G.S. Lewis; S. LeBlanc and R.O. Gilbert (2006): Defining postpartum uterine disease in cattle. The riogenology; 65:1516-30.

Silvestre, F.T. ; T.S.M. Carvalho; N. Francisco; J.E. Santos; C.R. Staples; T.C. Jenkins and W.W. Thatcher (2011): Effects of differential supplementation of fatty acids during the prepartum and breeding periods of Holstein cows. I. Uterine and metabolic responses, reproduction, and lactation. J. Dairy Sci., ,94:189-204.

Snedecor, G.W. and W.G. Cochran (1982): Statistical Methods.7ed.Iowa State Univ.Press Ames Iowa .USA.

Thatcher, W.W.; T.R. Bilby; J.A. Bartolome; Silvestre; C.R. Staples and J.E. Santos (2006). Strategies for improving fertility in the modern dairy cow. The riogenology;65: 30-44.

تأثير استخدام الأحماض الدهنية الغير مشبعة على الإنتاج ومناعة الجهاز التناسلى فى الأبقار الهولستين الحلابة

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استخدم فى هذه التجربة عدد 22 بقرة هولستين حلاب لدراسة تأثير استخدام علائق تحتوى على بذور الكتان أو بذور القطن الكاملة كمصدر للاوميجا 3 أو الاوميجا 6 على إنتاجية اللبن والحالة الصحية للرحم والمناعة والأداء التناسلى للأبقار الحلاب المجهده فى الفترة الإنتقالية قبل وبعد الولادة . بدأت المعاملات الغذائية للأبقار من 20-35 يوم قبل الولادة واستمرت بعدها حتى حدوث الإخصاب . تم تركيب العلائق لتكون متساوية فى كل من الطاقة والبروتين بحيث تبدأ التغذية عليها إبتداءً من أول شهر يوليو للأبقار العشار فترة إنتظار الولادة وتستمر على علائق ما بعد الولادة حتى حدوث الإخصاب ، تم حساب متوسط استهلاك المادة الجافة المأكولة قبل وبعد الولادة وكذلك حساب متوسط إنتاجية اللبن اليومية لكل بقرة ولمدة ثلاث أشهر بعد الولادة ، تم أخذ عينات شهريه من العلف تام الخلط وتحليلها ، كذلك تجميع عينات اللبن عند الأسبوع الثانى والرابع والسابع بعد الولادة لتحليلها، تم عمل تحليل كامل للبن وكذالك قياس تركيزات كل من الليزوزيم وأكسيد النيتروجين والبيتا هيدروكسى بيوتيرات وكانت النتائج كما يلى : أظهرت النتائج عدم وجود فرق ملحوظ فى استهلاك المادة الجافة المأكولة من العلف يومياً بين المجموعة الأولى (12.5كجم) والمجموعة الثانية (12.4كجم)، فيما كانت المجموعة الأولى أعلى أستهلاك لمتوسط المادة الجافة المأكولة من العلف بعد الولادة (20.55كجم) عن المجموعة الثانية (18.45كجم). متوسط إنتاجية اللبن فى المجموعة الأولى (36.42كجم) كان أعلى من متوسطه فى المجموعة الثانية (34.57كجم) برغم عدم وجود معنوية فى الفروق بين المجموعتين، كذالك عدم وجود إختلاف معنوى بين المجموعتين فى تركيزات كل من دهن ، بروتين ، الأجسام الصلبة دون الدهون واللاكتوز فى اللبن عند كل من الأسبوع الثانى والرابع والسابع بعد الولاده. كذالك تركيزات BHB كانت أقل معنوياً فى المجموعة الأولى عند الأسبوع الثانى (9.45 +_ 25 ميكرو جرام/ مول) عن تركيزاتها فى المجموعة الثانية (9.45+_ 25 ميكرو جرام/ مول) ، كذالك تركيزات الليزوزيم (ميكروجرام/ملل) فى اللبن فى الأسبوع الثانى والرابع والسابع بعد الولادة كانت أقل فى المجموعة الأولى (26.15, 45.5, 94.1,) معنوياً عن تركيزاتها فى المجموعة الثانية (192.7 , 217.8 و 246.3) ، كما أن تركيزات أكسيد النيتروجين (ميكرمول/ملل) فى اللبن فى المجموعة الأولى (14.3,18.4 و47.4) كان أقل معنوياً من تركيزه فى المجموعة الثانية (42.5,64.7 و91.8) ، كذالك كانت نسبة النيتروفيل فى غسول الرحم أقل نسبياً فى المجموعة الأولى عن المجموعة الثانية وأن كان الفرق بين المجموعتين لم يرقى للمعنوية ، فى حين كان عدد الأيام حتى حدوث أول شياع ، كذالك الأيام حتى حدوث أول تلقيح بعد الولادة أقل معنوياً فى المجموعة الأولى (75.1,36.9) عن المجموعة الثانية . (88.9 و86.1) ، كذالك عدد الأيام المفتوحة حتى حدوث الاخصاب وعدد التلقيحات اللازمه حتى حدوث الاخصاب كانت أقل نسبياً دون معنوية فى المجموعة الأولى (3.19 و172.9) عن المجموعة الثانية (4.07 و 195.4) ، كما أن نسبة الاخصاب عند التلقيحة الأولى والثانية والثالثة كانت أعلى فى المجموعة الأولى (20 و50 و10%) عن المجموعة الثانية (8.33 و25 و8.33%) ، كذلك كانت نسبة التخلفات التناسلية (أكثر من 3 تلقيحات) كانت أقل فى المجموعة الأولى (30%) عن المجموعة الثانية (58.33%). ونستخلص من هذه الدراسة أن استخدام الاوميجا 6 له تأثير مشجع على الالتهاب عكس استخدام الاوميجا 3 التى لها تأثير مقاوم له وبالتالى تأثير مقاوم للاجهاد مما يعطى فرصة أعلى للأبقار على حياة الجنين عند الحمل وتقليل تأثير الاجهاد الحرارى ومن ثم رفع الكفاءة التناسلية خاصة أثناء فصل الصيف .

الكلمات الدالة : الاوميجا 3 ، الاوميجا 6 ، المناعة ، الاجهاد الحرارى ، الأداء التناسلى .