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IMPROVEMENT THE PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF BROILER CHICKENS BY EARLY HEAT ACCLIMATION AND GLUTAMINE INJECTION

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ABSTRACT: This study aimed to investigate how to enhancing the resistance of broiler chicks to hot climate by using both early heat shock exposure and glutamine injection (GI). A total of 360 male chicks, one-day old of Cobb breed were randomly distributed into equal 6 treatments each of three replicates . The experimental groups were arranged as follows: the 1st group (T1) used as a control and reared under natural conditions, the 2nd group (T2) exposed to heat challenge (33±3ºC) from one up to 38 days of age, the 3rd group (T3) exposed to early heat shock (41±1ºC for four hours from 12:00 pm till 16:00 pm for 3 consecutive days) at the 3**th** up to 5**th** days of age, the 4th group (T4) was injected with Gl 0.75 mg/kg weight at the 2**th** day of age, then Exposed to early heat stress shock as in T3 ,the 5th group (T5) was exposed to heat shock (41±1ºC for four hours from 12:00 till 16:00 for 3 consecutive days) at the 3**th** up to 5**th** and 15**th** up to 17**th** days of age, and the 6th group of chicks (T6) were injected with Gl (0.75 mg/kg weight) at the 2**th** and 14**th** day of age then exposed to early heat shock as T5 group.

Results revealed that live body weight , body weight gain and feed conversion ratio were improved for chicks in T4 and T6 groups than other treatments with or without significant effect. Some blood constituents , antioxidant statues and immune parameters were affected treatments**.** Relative heart and Gizzard weights were significantly increased for all treatments as compared with the control expect of T3 group . Results indicated that glutamine injection (0.75 mg/kg BW)at the 2th and 14th days of age for broiler chicks then exposed to induce early heat stock at the 3th up to 5th and 15th up to 17th 3 and 15 days of age might be improved productive and physiological performance during rearing period.

Keywords: Early Heat shock exposures - Glutamine –broiler productive and physiological

INTRODUCTION

High ambient temperature is known as one of the major problems in broiler production especially in tropical and subtropical areas. Stress can be defined as responses of the body to abnormal conditions that potentially interrupt homeostasis or normal physiological equilibrium (Lara and Rostagno, 2013). Heat stress adversely affects feed intake, body weight, and carcass characteristics and may also cause oxidative stress in the body and develop abundant free radicals, promoting the occurrence of peroxidation of membrane lipids and hence attacking DNA and protein membranes (Rahman, 2003), as well as decrease of absorption of nutrients and secretion of digestive enzymes (Liu et al., 2016). The heat stress during the first week may lead to greater adaptability to high temperatures in the final rearing period where the endogenous heat production is higher, due to high metabolic rate of broiler chickens (TAN et al., 2010). Under extreme heat conditions, the exclusive activation of heat loss mechanisms is not sufficient to maintain body temperature within physiological limits, as the level of heat tolerance in avian species is apparently related to their ability to reduce the endogenous production of heat Nichelmann and Tzschentke, 2002 .According to Tan et al. (2010) with gradual increase of temperature, oxidative injury induced by hyperthermia in broilers becomes increasingly high as are levels of stress caused by heat exposure to short and daily heat shocks at early growth phases acclimate birds to heat stress and enhance their physiological responses (Yahav, 2009 and El-Moniary et al., 2010). Besides the role of amino acids as proteins and peptides constituents, some amino acids involved in regulation of metabolic pathways, thereby affecting growth, maintenance, immunity, protein accumulation and health. Glutamine is a free, neutral, non-essential amino acid, which found in higher levels in muscles and plasma, in concentrations representing approximately 50 to 80% of the total free amino acids content in the body (Sakamoto et al., 2006). Dietary supplemental glutamine improved performance and carcass characteristics of broiler under heat stress (Dai et al., 2009a). Glutamine could have several roles in metabolism and tissue homeostasis (Menconi et al., 2013), dietary supplementation of glutamine has been found to improve humoral immune response in poultry Bartell and Batal, 2007). So, this study was conducted to investigate the effects of glutamine injection of broiler chicks under heat stress on their productive and physiological performance

MATERIALS AND METHODS

This study was carried out at Private farm at Inshas ,Al Sharkia governments ,Egypt. A total of 360 male Cobb chicks one-day old were randomly divided into equal six experimental groups (each of three replicates, 20 chicks each). The 1st group was used as a control and reared under natural conditions. The 2nd group was managed thermally which exposed to heat challenge (33±3ºC) from one up to 38 1-38 days of age without glutamine injection. The 3rd group was exposed to early heat shock (41±1ºC for four hours from 12:00 pm till 16:00 pm for 3 consecutive days) at the 3th up to 5th 3 days of age without glutamine injection, the 4th group injected (intra peritoneal injection) with glutamine (0.75 mg/kg weight) at the 2th day of age then exposed to received the same early heat shock

stress in T3 group,. the 5th group was exposed to early heat shock (41±1ºC for four hours from 12:00 till 16:00 for 3 consecutive days) through two times, the first one at the 3**th** up to 5th , while the second at 15th up to 17th two times at 3 and 15 days of age, while the 6th group of chicks injected with glutamine (0.75 mg/kg weight intra peritoneal injection) at the 2th and 14th days of age then exposed to early received heat shock for two times as T5 group). Chicks were reared under similar managerial and healthy conditions .Feed and water were provided ad libitum through the experimental period .The experimental diets were formulated to supply the nutritional requirements recommended by the NRC(1994) and are present in Table 1. Birds were exposed to natural day-light and artificial light to increase the day light length until end of experimental periods.

Measurements and estimated parameters:

1. Feed intake and body weight were recorded at 21 and 38 days of age weekly. Feed conversion and body weight gain were calculated for the periods of 1-21, 21-38 and 1-38 days of age same ages. Ambient temperature AT°C ranged from 29-30and relative humidity RH% ranged from 64.52- 65.88% during the experimental period
2. Blood samples: At the end of experimental period (38 days), blood samples were withdrawn from the wing vein per replicate for each treatment. the first part was placed into tube containing heparin to get plasma, while the 2nd sample part was put in non-heparinized tube to obtain serum.

***A.* Plasma samples**

The tubes which containing heparin were centrifuged at 3000 rpm for 15 minutes to get plasma to determine total protein, , glucose, total lipids, Triglyceride, HDL,LDL and total cholesterol which determined by using commercial kits, while globulin was calculated by subtraction albumin from total proteins values and , A/G ratio was calculated by dividing albumin to globulin values. . Also, antioxidant enzymes such as superoxide dismutase (SOD), glutathione peroxidase (GPX) and total antioxidant capacity (TAOC) were evaluated using commercial kits produced by Bio-diagnostic, Egypt

***B.* Serum samples**

The blood samples in non- heparinized tubes were centrifuged at 3000rpm for 15 minutes to obtain serum to determine in which antibody titers against Newcastle disease virus (NDV), Infections bronchitis virus (IBV) and Avian Influenza virus (AIV) by hemagglutination inhibition tests and expressed as Log2 of the reciprocal of the highest serial dilution Immunoglobulin concentrations IgG and IgM were determined by enzyme-linked Immunosorbent assays using commercial ELISA kits according to manufacturer's Instructions (Sun Biomedical Technology Co**.,** BeiJing, 10039**).**

3- Carcass traits: At 38 days of age ,three chicks were taken randomly from each treatment individual body weight was recorded and slaughtered, the weights of liver, heart, and gizzard were expressed as relative to carcass weight

4- Statistical Analysis

Data obtained were statistically analyzed using the General Liner Model of SPSS (2008). The following model was used

$Yij = \mu + Ti + eij$ where:

Yij = an observation,

μ = overall mean,

Ti = effect of treatment (i=1,2,3 and 6) and
eij = experimental random error.
Significant differences among means were tested by Duncan's Multiple Range Test Duncan (1955) at 5% level of significance

RESULTS AND DISCUSSIONS:

Growth performance parameters:-

Heat acclimation and glutamine injection in broiler chicks resulted in a significant improvement in live body weight (LBW) at the end of experimental period (Table 2).The heaviest LBW was recorded for chicks of T4 and T6 groups, which were significantly where their LBW was increased by about 10.76 and 9.59% % than the control group at 38 days of age, while . the lowest improvement (3.74%) was achieved for T2 group. These results are in agreement with those obtained by Dai et al. (2009a) who reported that glutamine supplementation significantly improved performance of broiler chicks under heat stress .Dietary glutamine supplementation may alleviate heat stress-caused deterioration in performance of broilers (Dai et al., 2009b). The improvement of growth performance of birds by glutamine injection and glutamine supplementation may be due to the greater nutrient absorption and utilization because of increasing in villi height which resulted in more surface area for absorption (Bartell and Batal, 2007).

Broiler body weight gain (BWG) was significantly affected by heat acclimation and glutamine injection during the periods of 21-38 and 1-38 days of age experimental period (Table 2). Chicks in T4 group recorded a significant improvement in BWG thanT1 and T2 groups during the overall experimental period (1-38 days of age. However, chicks BWG was improved by about 11.1, 9.88, 9.03, 4.68 and 3.87 % for the groups of T4, T6, T3, T5 and T2 than the control group, respectively during the whole experimental period (1-38 days of age). The improvement BWG in body weight gain of birds in this study may be due to increasing height of villi of intestine which resulted in more surface area for absorption of nutrients (Bartell and Batal, 2007). These results are in agreement with Dai et al. (2009) who obtained significant improvement in weight gain and feed efficiency in broiler chickens supplemented with glutamine the diet.

Results in Table 2 show that feed intake (g/ bird) was significantly affected due to heat acclimation and glutamine injection in broiler chicken. It could be noticed that birds were exposed to early heat shock (41 ±1ºC for four hours for 3 consecutive days) at 3 days of age without glutamine injection (T3) had consumed lower amounts of feed than those of other treatments during period of 1-21 days of age, while birds at T5 had consumed higher amount of feed as compared with other treatments during the same period. Feed intake of chicks in T6 group (T6) was lowered lower than other treatments during the period of 21-38 days of age . The highest value of feed intake was recorded for chicks in T2 group,while the lowest value was recorded for the control group during the whole experimental period (1-38 days). No significant differences were observed in feed conversion (FCR) (g feed/ g gain) between the experimental groups at the period of 1-21 days of age (Table 2) .While there were significant ($p \leq 0.05$) differences of broiler exposed to heat stress and early age thermal condition from 21-38 and 1-38 days of age compared with control group. All chicks exposed to early heat stock stress with or

without glutamine injection had improved feed conversion at the periods of 21-38 and 1-38 days of age) compared to control group, moreover, chicks in T4 and T6 groups recorded the best FCR than other treated groups during 1-38 days of age. The beneficial effect of Gl supplementation on growth performance of chickens has been associated with better development of the intestinal mucosa (Yi et al., 2005; Bartell and Batal, 2007). Glutamine is responsible for maintenance of the mucosal structure (Khan et al., 1999) and reconstitution after damage (Newsholme, 2001). The results of mortality rate (MR) are shown in Table 2. The highest MR was recorded for T2 and T4 while the lowest was recorded for T1 and T6 group during the period of 1-38 days of age.

The present finding was confirmed by Shakeri et al. (2014) who reported reduction in mortality rate in broiler challenged with high stocking density and fed diet supplemented with glutamine and glutamic acid

Blood constituents:

Table 3 illustrated the effect of glutamine injection under thermo neutral, heat stress and heat shock conditions on some blood plasma constituents of broilers at the end of experimental period . Results show that total protein was significantly increased for all experimental groups as compared with control and T2 groups, where the highest level of total protein was recorded for chicks in T6 while the lowest value was recorded with T2 compare to all treated groups Chicks in all treated groups had higher globulin as compared with control group. The increase of globulin might be due to the improve of the immune responses of chicks that exposed to early heat shock stress with or without Gl injection compared with control group. In addition , increase of globulin concentration utilized as a pointer of immune and antibody production (El-Kaiaty and Hassan,2004). The highest albumin was recorded for chicks in T6 ,while the lowest albumin was recorded for control group at the end of experimental period (38 days of age.).Moreover, increase levels of total protein, globulin and albumin could be attributed to multiple glutamine injection which is an abundant amino acid in the body and it is involved in nucleic acid synthesis (Olubodun et al., 2015).Total lipids, triglycerides, cholesterol, glucose and LDL were decreased for all treated groups compared with control group (Table 3).

Antioxidant statues:

Results in Table 3 show that glutamine injection resulted in a significant ($p<0.05$) decrease in total antioxidant capacity (TAOC) for broilers reared under heat stress with glutamine injection compared with those reared in thermo-neutral from 1-38 days of age. On the other hand, superoxide dismutase (SOD) and glutathione activity were significantly increased for all treated groups compared with the control . this observation is in agreement with Hongying (2006); JinGe *et al.* (2009) and Wenli *et al.* (2011). This is may be due to the role of Gl in eliminating free radicals because they acts as a precursor for the important antioxidant glutathione synthesis (Wu, 1998). Moreover Gl is a component of the glutathione peptide (Frauwirth, 2015)

Immune parameters:

Results of Table 4 demonstrated the effect of glutamine injection under thermo neutral, heat stress and heat shock conditions on IgM, IgG and antibodies against (Newcastle disease virus (NDV), infection bronchitis virus (IBV) and

influenza virus (AIV) . It was found that chicks in T6 group had significant ($P<0.05$) increase titers of NDV (19.36%), IBV (23.75%) and AIV (44.5%) than the control group. In this respect (Morsy,2013) reported that multiple heat shock exposures led to over expression of HSP70 that inhibit release of cytokines, oxygen free radicals, nitric oxide and hence increased immune responses).The groups that received glutamine injection in addition to heat shock exposures showed best values for antibody titers of, as glutamine causes excessive production of HSP70 (Youssef et al.,2016). These results are in agreement with Dai et al. (2009) who reported that dietary Gl supplementation may reduce the detrimental effects of heat stress .Moreover, the significant increase of antibody titers in this study was in parallel with the significant increase of globulin concentration that is use as an indicator of immune response and source of antibodies production (El-kaiaty and Hassan, 2004)). The improvement in the immunity may be due to glutamine supplementation increase the production of antibodies and macrophages and their phagocytic ability, as well as modulating the production of cytokines to a normal level by protecting lymphoid organs from oxidative damage via the suppression of lipid peroxidation due to enhanced antioxidant enzymes activities in these organs in heat stressed broiler chicks (Niu *et al*., 2009; Xu *et al*., 2014; Xu and Tian, 2015).

Carcass characteristics:

Carcass characteristics of broilers with or without glutamine injection under thermo neutral, heat stress and heat shock conditions at the end of the experimental period are shown in Table 5.It could be observed that carcass weight and liver relative weight were not significantly differ among all treatments, while relative heart and gizzard weights were significantly increased ($p\leq0.05$) than the control group. These results are in a partiall agreement with those obtained by Morsy (2013) who demonstrated that thermal shock during the early raising period had no significant effect on final carcass yield and liver weight.

CONCLUSION

Results indicated that glutamine injection (0.75 mg/kg weight) at the 2th and 14th days of age before induces early heat shock(41±1ºC for four hours from 12:00 pm till 16:00 pm for 3 consecutive days) for two times (at the 3th up to 5th then at 15th up to 17th days of chick's age) could be used to maximize and improve productive and physiological performance of broiler chickens**.**

Table (1): Composition and calculated analysis of the basal diets

Composition (per 100 Kg)	**Starter (1 to 21 d)**	**Grower (22 to 38 d)**
Yellow corn	52.25	62.8
Soybean meal (44% CP)	34	23.66
Corn gluten meal (60% CP)	5.87	6
Dicalcium phosphate	1.9	1.62
Vegetable oil	3.4	3.75
Salt	0.3	0.3
Limestone	1.4	1.1
Vit. & Min. Premix**	0.3	0.3
DL-Methionine	0.25	0.18
L-Lysine-HCl	0.33	0.29
Total	100	100
Calculated analysis (%):**		
Crude protein (CP)	23.56	19.87
ME; kcal/kg	3037	3190
Ether extract	6.01	6.60
Crude fiber	3.71	3.19
Calcium	1.09	0.89
Av. Phosphorus	0.42	0.35
Lysine	1.42	1.13
Methionine	0.64	0.53
Methionine + cysteine	1.06	0.90

*Vitamin and mineral premix: each 3 Kg of vitamin and mineral premix (Special component from commercial source AGRIVET Co.) contains: Vit. A., 12000000 IU; Vit. D3, 2000000 IU; Vit. K3, 2000 mg; Vit. E, 10000 mg; Vit. B1, 100 mg; Vit. B2, 5000 mg; Vit. B6, 1500 mg; Vit. B12, 10 mg; Biotin, 50 mg; Choline chloride, 250000 mg; Pantothenic acid, 10000 mg; Nicotenic acid, 3000 mg; Folic acid, 1000 mg; Manganese, 60000 mg; Iron, 30000 mg; Selenium, 100 mg; Copper, 10000 mg; Iodine, 1000 mg; Cobalt, 100 mg; Carrier (Ca Co3) add to 3kg.

** Calculated according to NRC (1994) requirements.

Table (2): Growth performance as affected by early heat shock stress and glutamine injection in broiler chicken during different experimental periods

Age (days)	Experimental groups						SEM	Sig.
	T1	T2	T3	T4	T5	T6		
Live body weight (g./ chick)								
At hatch	41.38	41.2	39.6	40.9	40.6	41.13	0.40	NS
At 21 day	896.1	921.1	906.3	925.2	883.8	890.9	6.61	NS
At 38 day	1636.7^{c}	1697.9^{bc}	1778.6^{ab}	1812.9^{a}	1710.2^{abc}	1793.7^{ab}	18.48	**
Body weight gain (g/ chick)								
1- 21d	854.2	879.9	866.5	884.3	843.2	849.8	6.69	NS
21-38d	740.68^{c}	776.7^{bc}	872.5^{ab}	887.3^{ab}	826.3^{abc}	902.7^{a}	18.68	**
1-38d	1594.9^{c}	1656.7^{bc}	1739.0^{ab}	1772.03^{a}	1669.6^{abc}	1752.56^{ab}	18.60	**
Feed Intake (g/ chick)								
1- 21d	1128.6^{ab}	1107.4^{b}	1102.5^{b}	1118.5^{ab}	1145.9^{a}	1143.3^{a}	5.26	**
21-38 d	2216.4^{c}	2330.8^{a}	2305.1^{a}	2274.7^{b}	2219.5^{c}	2214.6^{c}	11.65	**
1-38d	3345.1^{c}	3438.2^{a}	3407.6^{ab}	3393.3^{abc}	3365.4^{bc}	3357.9^{bc}	9.64	**
Feed conversion (g. feed/ g. body weight gain)								
1- 21d	1.32	1.25	1.27	1.26	1.35	1.34	0.014	NS
21-38d	2.99^{a}	3.02^{a}	2.64^{b}	2.57^{b}	2.69^{ab}	2.46^{b}	0.061	**
1-38d	2.09^{a}	2.07^{a}	1.95^{b}	1.91^{b}	2.01^{ab}	1.91^{b}	0.021	**
Healthy state during the overall experimental period (1-38 day of age)								
Mortality,%	3.33	6.67	5.00	6.67	5.00	3.33	0.90	NS
Viability %	96.67	93.33	95.00	93.33	95.00	96.67	0.90	NS

Means designated with the same letter within the same row are not significantly different at 0.05 level of probability.

Table (3): Some blood constituents as affected early heat shock stress and glutamine injection in broiler chickens.

Parameters	Experimental groups						SEM	Sig.
	T1	T2	T3	T4	T5	T6		
Blood constituents								
Glucose, (mg/dl)	269.02^{a}	265.92^{ab}	251.97^{b}	232.91^{c}	214.63^{d}	203.53^{d}	3.34	**
Total protein, (mg/dl)	6.44^{e}	7.22^{d}	7.89^{c}	8.36^{bc}	8.68^{ab}	9.08^{a}	0.12	**
Albumin (A), (mg/dl)	3.72^{d}	3.90^{d}	4.52^{c}	4.75^{b}	4.93^{b}	5.15^{a}	0.03	**
Globulin (G), (mg/dl)	2.72^{c}	3.32^{b}	3.38^{b}	3.60^{ab}	3.75^{ab}	3.92^{a}	0.08	**
A/G ratio	1.37^{a}	1.18^{b}	1.34^{ab}	1.32^{ab}	1.32^{ab}	1.31^{ab}	0.06	**
Total lipids, (mg/dl)	695.05^{a}	670.16^{ab}	657.87^{bc}	633.60^{c}	600.76^{d}	572.18^{d}	6.39	**
Triglycerides , (mg/dl)	136.88^{a}	129.11^{ab}	120.34^{bc}	111.39^{c}	97.38^{d}	83.32^{e}	1.96	**
Total cholesterol, (mg/dl)	212.64^{a}	197.03^{ab}	187.36^{bc}	176.71^{bc}	165.55^{c}	142.72^{d}	4.22	**
HDL cholesterol, (mg/dl)	49.06^{d}	58.46^{c}	65.96^{b}	69.88^{b}	77.31^{a}	80.17^{a}	1.17	**
LDL cholesterol, (mg/dl)	72.98^{a}	68.23^{ab}	67.81^{ab}	64.98^{b}	57.43^{c}	50.21^{d}	1.3	**
Antioxidants parameters								
Glutathione	5.99^{e}	6.34^{d}	6.64^{cd}	6.97^{c}	7.36^{b}	7.74^{a}	0.017	**
TAOC total antioxidant capacity (TAOC)	0.85^{a}	0.83^{a}	0.80^{a}	0.76^{ab}	0.70^{b}	0.66^{c}	0.16	**
superoxide dismutase (SOD)	1.80^{e}	2.05^{d}	2.28^{c}	2.50^{bc}	2.63^{ab}	2.80^{a}	0.046	**

Means designated with the same letter within the same row are not significantly different at 0.05 level of probability.

Table (4): Some blood immunity of Sera of broilers chicken as affected by early heat shock stress and glutamine injection in broiler.

Parameters	Experimental groups						SEM	Sig.
	T1	T2	T3	T4	T5	T6		
IgG mg/ml	1.31^{e}	1.54^{de}	1.83^{d}	2.24^{c}	2.58^{b}	3.06^{a}	0.14	**
IgM mg/ml	0.78^{d}	0.98^{d}	1.24^{c}	1.44^{bc}	1.60^{b}	1.88^{a}	0.09	**
Titer against NDV	7.54^{c}	7.73^{de}	7.98^{d}	8.34^{c}	8.66^{b}	9.00^{a}	0.12	**
Titer against IBV	6.40^{e}	6.62^{e}	6.97^{d}	7.34^{c}	7.63^{b}	7.92^{a}	0.13	**
Titer against H9N2	6.00^{c}	7.00^{bc}	8.33^{ab}	8.67^{a}	9.00^{a}	8.67^{a}	0.28	**

Means designated with the same letter within the same row are not significantly different at 0.05 level of probability.

Table (5): Some carcass traits of broilers chicken as affected by early heat shock stress and glutamine injection in broiler chicken at 38 day of age

Parameters	Experimental groups						SEM	Sig.
	T1	T2	T3	T4	T5	T6		
Carcass (g)	1235.0	1266.6	1288.3	1185.0	1156.6	1213.3	19.33	NS
Liver, %	3.11	3.56	2.97	3.52	3.31	3.27	0.11	NS
Heart, %	0.37^{b}	0.39^{b}	0.38^{b}	0.55^{b}	0.57^{b}	0.83^{a}	0.04	**
Gizzard, %	2.02^{ab}	2.38^{ab}	1.68^{b}	2.58^{ab}	3.18^{a}	2.54^{ab}	0.16	**

Means designated with the same letter within the same row are not significantly different at 0.05 level of probability.

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الملخص العربى

تحسين الاداء الانتاجى والفسيولوجى لدجاج التسمين بالتأقلم المبكر للحرارة وحقن الجلوتامين

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نهدف هذه الدراسة بحث امكانية تحسين الاداء الانتاجى والفسيولوجى عن طريق حقن الجلوتامين والتعريض المبكر لصدمات حرارية خلال فترة النمو لدجاج التسمين .

تم تقسيم عدد 360 ذكر تسمين كب عمر يوم عشوائيا الى 6 مجموعات متساوية وكل مجموعه الى 3 مكررات. وكانت المعاملات كما يلى :-

المعامله الاولى (كنترول) : تمت التربية تحت ظروف البيئة الطبيعيه لم تتعرض للمعاملات

المعامله الثانية تعرضت لدرجه حرارة 33 ± 3 م^5 من عمر 1-38 يوم

المعامله الثالثه :تعرضت الكتاكيت الى صدمه حرارية مبكرة (41±1 م^5 لمدة 4 ساعات من الساعة 12ظهرا الى الساعة الرابعه عصرا لمدة ثلاث ايام متتالية) عند اليوم الثالث حتى الخامس من عمر الكتاكيت

المعامله الرابعة : كما هى المعاملة الثالثة ولكن يتم الحقن بالجلوتامين (0.75 ملجم / كجم وزن حى) فى اليوم الثانى من عمر الكتاكيت قبل التعرض للصدمه الحرارية المبكرة عند اليوم الثالث من عمر الكتاكيت

المعامله الخامسة : تعرضت الكتاكيت الى صدمتين حراريتين (41±1 م^5 لمدة 4 ساعات من الساعة 12ظهرا الى الساعة الرابعه عصرا لمدة ثلاث ايام متتالية) الأولى عند اليوم الثالث حتى الخامس من عمر الكتاكيت والثانية عند اليوم الخامس عشر حتى السابع عشر من عمر الكتاكيت.

المعامله السادسة : كما هى المعاملة الخامسة ولكن يتم الحقن بالجلوتامين (0.75 ملجم / كجم وزن حى) مرتين الأولى منها فى اليوم الثانى من عمر الكتاكيت، والثانية عند اليوم الرابع عشر من عمر الكتاكيت قبل التعرض الى الصدمتين الحراريتين عند عمر 3 ، 15 يوم من عمر الكتاكيت

اوضحت النتائج مايلى :-

لوحظ حدوث زيادة معنوية فى كلا من وزن الجسم الحى ومعدل الزيادة الوزنيه ومعدل تحويل الغذاء فى كتاكيت المجموعه الرابعة والسادسة مقارنة بباقى المعاملات . تأثرت بعض مكونات الدم و قياسات مضادات الاكسده وقياسات المناعه بالمعاملات . بينما حدثت زيادة معنوية فى الوزن النسبى للقونصة فى كل المعاملات ماعدا المعاملة رقم 3 حيث انخفض الوزن مقارنة بالكنترول .

تخلص هذه الدراسة الى إمكانية حقن الكتاكيت بالجلوتامين (0.75 ملجم / كجم وزن حى) عند اليوم الثانى والرابع عشر من العمر ثم تعريضها للصدمه الحرارية المبكرة (41±1 م^5 لمدة 4 ساعات من الساعة 12ظهرا الى الساعة الرابعه عصرا لمدة ثلاث ايام متتالية على مرحلتين الأولى منها عند اليوم الثالث حتى الخامس من عمر الكتاكيت والثانية عند اليوم الخامس عشر حتى السابع عشر من عمر الكتاكيت) خلال فترة النمو ليدارى التسمين لتحسين الاداء الانتاجى والفسيولوجى لها