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Original Article

An Attempt to Alter the Primary Sex Ratio in the Offspring of Arbor Acres Plus Broiler Breeders by Prednisolone Administration in Feed

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Abstract

The effects of feeding Arbor Acres Plus broiler breeders on diets containing different levels of prednisolone on the primary sex ratio of the offspring were studied. A total number of 132 healthy, vaccinated, Arbor Acres Plus chickens at 59 weeks of age were selected, individually weighed, leg banded and then distributed into four treatments. Each treatment contained three replicates of 11 birds each (1 male + 10 females). Birds in groups 1 to 4 were provided with basal diet supplemented with prednisolone at the levels of 0, 5, 10 and 20 mg/kg diet, respectively, over a period of 45 days. Eggs were collected for duration of 30 days and were incubated at temperature of 37.8°C and 65% relative humidity. The hatching chicks were feather sexed at 0 day of age. The results showed that birds fed diets containing Prednisolone at the levels of 5 and 20 mg prednisolone/kg diet had significantly ($P<0.05$) higher percentage of males in their offspring compared to the control group. Prednisolone supplementation had no effects on most of blood parameters under study except that it significantly increased plasma albumin concentrations. From these results, it could be concluded that prednisolone supplementation at the levels of 5 and 20 mg prednisolone/kg diet altered the sex ratio in the offspring of broiler breeders (Arbor-Acres).

Keywords: *Sex ratio, Offspring, Broiler breeders, Prednisolone, Cortisone.*

Introduction

To maintain homeostasis and encourage patterns of physiological and behavioural response toward survival, environmental perturbations cause higher blood glucocorticoid concentrations. As a result, plasma glucocorticoid concentrations are frequently employed to track stress reactions in various animals. If the unfavorable conditions that cause high hormone levels do not prevent reproduction, they may change the phenotypic of the offspring to help them succeed in the local environment. Birds are an intriguing subject since the female is the heterogametic sex, meaning she is likely to determine the sex ratio of her progeny. In a number of species, sex ratio biases with respect to environmental or maternal influences have recently been proven (Goerlich-

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Jansson, 2013). Because biassed male and female offspring ratios have been observed with respect to corticosterone elevation, sex ratio studies concentrating on corticosterone in birds have yielded conflicting results (Aslam *et al*., 2014).

Several investigations predict that mothers in good condition should bias the sex ratio of their offspring toward males and mothers in poor condition should produce a bias toward females (Trivers and Willard 1973). Petrie *et al.,* (2001) suggested that maternal steroids could influence sex chromosome segregation. Corticosterone is the primary stress hormone in bird species, including chicken, and stimulates gluconeogenesis to provide the body with more energy when birds face stressful situations (Carcia and Harvey, 2000). Babacanoglu *et al*., (2013) suggested that corticosterone administration in broiler breeder diets could be used as a stress model and to evaluate hormone-mediated maternal effects. Adding corticosterone in feed (Lin *et al.,* 2004) or drinking water (Hull *et al*., 2007) over a period of days can make transient changes in plasma glucocorticoid concentrations that occur when animals are subjected to chronic stress. Recent research demonstrates that females with persistently high corticosterone levels in plasma produce female biased offspring sex ratios in avian species, (Schwabl *et al.,* 1997). According to Love *et al*., (2005), corticosterone treatment of female European starlings (Sturnus vulgaris) resulted in a female-biased sex ratio at hatching. Additionally, Pike and Petrie (2006) demonstrated that experimental elevation of corticosterone by injection resulted in female-biased sex ratios in captive Japanese quail. However, Love and Tony (2008) found that maternal corticosterone had no influence on the sex ratio of main offspring in European starlings. Additionally, following direct injection of corticosterone into laying hens, Chin *et al.,* (2009) reported no significant changes in sex ratio at hatching. Furthermore, Aslam (2014) found that the sex ratio was not significantly different ($P>0.05$) between in laying hens in control and corticosterone treated groups. On the other hand, after corticosterone injections five hours before the predicted time of ovulation, Kaleta and Redmann (2008) found male biased primary sex ratios in laying chicken (Gallus gallus). Moreover, a skewed male sex ratio has been linked to chronically increased blood corticosterone levels in birds, according to Goerlich (2009). Prednisolone was discovered and approved for medical use in 1955. It is on the World Health Organization's List of Essential Medicines, and is the most effective and safe medicine needed by a health system. It is available as a generic drug.

In previous studies, researchers evaluated the effects of steroid injection on primary sex ratio, This process is difficult to by tasted commercially because of the huge number of birds need to be injection and it is very hard to keep track with the time of ovulation for each bird in the barn to determine the time required for each bird. Therefore, in this study, we added prednisolone to the feed to overcome this problem and to facilitate the application of the process.

Materials and Methods

This study was carried out at one of the Farms that belong to Dakahlia Poultry Company, Gharbiya Governorate, Egypt. A total number of 132 healthy,

vaccinated, Arbor Acres Plus chickens with mating ratio of 1:10 male to female, respectively at 53 weeks of age. All birds were distributed into four treatments of 33 birds. Each treatment contained three replicates of 11 birds each (1 male + 10 female). Birds in all experimental groups had commercial diets which recommended for males and females of strain (Tables 1 and 2).

Table 1. The composition of the basal diet.

Ingredients	Female Diet (%)	Male Diet (%)
Yellow corn (7.5% CP)	62.76	58.45
Wheat bran (14% CP)	12.1	28.1
Soybean meal (47% CP)	14.3	0.0
Sunflower meal (36% CP)	0.0	10.0
Di-calcium Phosphate	1.0	0.6
Limestone	8.1	1.3
Potassium chloride	0.1	0.0
Sodium chloride	0.2	0.2
Sodium bicarbonate	0.2	0.2
L-Methionine	0.15	0.08
L-Threonine	0.07	0.0
L-Tryptophan	0.015	0.0
L-Lysine	0.0	0.12
Choline chloride 60%	0.10	0.10
Breeders Premix*	0.168	0.168
Hi Phoss**	0.006	0.006
Antioxidant	0.015	0.015
Biotronic Top 3***	0.3	0.3
Manganese sulfate	0.025	0.0
Mycofix Plus****	0.3	0.3
Poultry Star MI*****	0.05	0.05
Total	100	100

* Each kg of vitamin- mineral premix with Vit. A 12000 IU; Vit. D3 2000 IU; Vit. E. 100mg; Vit. k3 2mg; Vit.B1 100mg; Vit. B2 40mg; Vit. B6 15 mg; Pantothenic acid 100mg; Vit.B12 0.01mg; Folic acid 10mg; Niacin 20mg; Biotin 0.05mg; Choline chloride (50% choline) 500 mg; Zn 55mg; Fe 30mg; I 1mg; Se 0.1mg; Mn 55mg; Ethoxyqain 3000 mg.

** Hi-Phoss is a liquid formulation containing magnesium, potassium and phosphorus in carefully balanced proportions.

*** Biotronic Top3 is a compounds working Amnionium fornate Formic acid Acetic acid: Propionic acid Flavouring cormpounds

**** Mycofix® Plus 5.Z with ZENzyme® is an innovative, all-in-one feed additive providing next-generation mycotoxin risk management for breeding animals and their offspring.

***** PoultryStar® is a well-defined, poultry-specific, multi-species synbiotic product that promotes a beneficial gut microbiota through the combined action of carefully selected probiotic microorganisms and prebiotic fructooligosaccharides.

Feed amount was restricted to 163gm / bird/ day for females, and 142gm/ bird/ day for males. All birds were housed in floor pens (5.5/m^2), in a closed house and exposed to 15 hour light: 9 hour dark.

Table 2. The proximate chemical analysis of the basal diet*.

Nutrients	Female Diet	Male Diet
Dry Matter, %	88.71	87.90
Moisture, %	11.28	12.10
Crude Protein, %	13.29	12.09
True Protein, %	13.26	12.07
ME Poultry, (MJ/kg)	11.69	11.29
Starch, %	42.82	42.47
Arginine, %	0.81	0.77
Lysine, %	0.62	0.51
Methionine, %	0.37	0.31
Total Sulfur Amino Acids, %	0.60	0.55
Valine, %	0.63	0.59
Arginine, %	0.76	0.71
Histidine, %	0.29	0.25
Isoluecine, %	0.49	0.39
Lysine, %	0.54	0.44
Methionine, %	0.35	0.29
Threonine, %	0.49	0.35
Tryptophan, %	0.14	0.11
Ash, %	10.27	4.31
Available Phosphorus, %	0.39	0.37
Calcium, %	3.51	0.85
Chloride, %	0.23	0.21
Potassium, %	0.71	0.70
Sodium, %	0.16	0.17
Total Phosphorus, %	0.55	0.61
Fat, %	2.96	3.39
Linoleic Acid, %	1.51	1.75
Density, Kg/m	660.35	544.40
Fiber, %	3.16	6.10

*Calculated according to NRC (1994).

Treatments

The 1st group (C) was fed the basal diet without Prednisolone, while the 2nd (T1), the 3rd (T2) and the 4th (T3) groups were fed the basal diet supplemented with Prednisolone at the levels of 5, 10 and 20mg prednisolone/kg diet, respectively. The source of prednisolone is Solupred® Oro 20 mg (pharmacological glucocorticoids) tablets, which contains 20mg prednisolone, polyacrylate dispersion, mannitol, aspartame magnesium stearate for one Tablet. Manufacturing: Sanofi Winthrop Industrie - Sanofi Aventis – France.

Parameters studied

1. Sex ratio in offspring

The sex of the embryos and chicks that failed to hatch was identified by dissecting the embryo or chick and examining it under binocular to distinguish

their reproductive organs (ovaries and testes). The method used for sexing hatched chicks was feather sexing at zero day old.

By spreading the wing gently with your fingers and looking down on the upper surface of wing, the line of covert feathers on top of the wing surface, with the line of primary feathers below it can be identified.

1.1. If the primary feathers are longer than the covert feathers, then the chick is female.

1.2. If the coverts and primaries are the same length, or the primaries are shorter than the coverts, then the chick is male.

2. Hematological Studies

At the end of the experiment, blood samples were collected from five females (5♀) per treatment and two aliquots were taken in heparinized tubes. One aliquot was used to determine white blood cell count and deferential WBC_s count. The other aliquot was centerifugated at 3000 rpm / 15 min to obtain blood plasma. Then the plasma was stored at -80°C till biochemical and immunological analysis.

2.1. Differential Leucocytes count

To determine differential Leucocytes count, the blood was smeared on a glass slide using a cover glass technique (Campbell, 1988) and the slides were stained by Giemsa stain. Heterophils, band (Staff) and Segmented were counted once on each slide using a light microscope (oil immersion lens) was measured according to Wintrobe (1967).

2.2. Biochemical Determinations

Plasma total protein was determined according to Doumas *et al.,* (1981) and albumin was determined according to Doumas *et al.,* (1972) using assay kits supplied by BioMed Chemical Company, Egypt. Globulin values were determined by subtracting albumin values from total protein values. Plasma glucose was determined according to Trinder, (1969) using assay kits supplied by Diamond Chemical Company, Germany. Plasma Cholesterol was determined according to Watson, (1960) using assay kits supplied by BioMed Chemical Company, Egypt.

3. Statistical analysis

Data obtained from experiment were tested for the significance of treatments effect by GLM using the SAS Institute procedure (2013). The mathematical model used in natural substances experiment was:

$$Yij = \mu + Ti + rj + eij$$

Where: Y_{ij} is any observation by feed treatment T_i for i = types; μ = the population mean; T_i = Treatments type effect; r_j = Replicate effect; e_{ij}= Experimental error.

Differences among means of the experimental groups were testified for significance by Duncan's multiple range test (Duncan, 1955).

Results and Discussion

1. Primary sex ratio

The effect of dietary prednisolone administration on primary sex ratio is presented in Table (3). Our results showed that the sex ratio of the offspring in the control group (C) was 32.2 males: 67.7 females. In addition, significant changes have been observed in offspring sex ratio (P<0.0001) due to feeding the hens on a diet supplemented with different levels of prednisolone. Feeding on a diet supplemented with prednisolone was found to significantly increase the percentage of males in the offspring. The percentages of males in T1 and T3 groups were significantly higher than that of the control (C). The percentage of males in the T2 group was intermediate between that of C and T1.

In other words, the addition of prednisolone to the diets of Arbor Acres Plus laying hens led to a sex ratio bias in the offspring towards males. The 20 mg prednisolone/kg (T2) administration has led to an increase in the percentage of males (9.5 %) compared to that of the control (C).

Table 3. Effect of prednisolone supplementation on sex ratio for offspring.

Treatment	Female Number	Male Number	Female Percentage	Male Percentage
C	27.89±0.35	13.33^{c}±0.41	67.70^{a}±0.66	32.30^{c}±0.66
T1	24.56±2.14	14.44^{cb}±0.63	62.26^{b}±1.57	37.74^{b}±1.57
T2	27.89±0.35	15.00^{b}±0.50	65.06^{ab}±1.01	34.94^{cb}±1.01
T3	24.78±0.49	17.78^{a}±0.32	58.21^{c}±0.47	41.79^{a}±0.47
P. value	0.0589	<0.0001	<0.0001	<0.0001

$^{a \text{ and } b}$ Means in the same rows with different superscript are significantly different (P≤0.05). **C**= Control (without supplementations), **T1**= 5 mg prednisolone/ kg diet, **T2**= 10 mg prednisolone/ kg diet, **T3**= 20 mg prednisolone/ kg diet

The difference in the concentration levels of corticosterone works to confuse the activity of sex hormones, which in turn leads to modifying the sex ratio during the stage of the first thread division, as the high concentration of corticosterone with moderation in the concentration of progesterone and testosterone before a specific period of ovulation can work to deviate the sex ratio by impact on sex chromosomes (DuRant *et al.,* 2016). Corticosterone could affect offspring sex ratio through a number of mechanisms, including inhibitory effects on estrogens or progesterone (Sapolsky *et al.,* 2000), both of which have been suggested to be involved in offspring sex manipulation (Correa *et al.,* 2005). The effects of Corticosterone on offspring sex ratio may be occurring via segregation modification during meiotic segregation (Gam *et al.*, 2011).

Perhaps chronic corticosterone elevations act on offspring sex through a different mechanism compared to acute elevations. For example, acute elevations of corticosterone may act directly on the ovarian follicle, but chronic elevations may act through the modulation of other hormones, such as testosterone or progesterone, or through other factors that subsequently influence offspring sex.

Over the long term, corticosterone can influence the amount of yolk precursors deposited into follicles (Salvante and Williams, 2003) and, as a result, the rate of follicular growth, which may influence meiotic segregation, processes (Young and Badyaev, 2004).

It is also possible that corticosterone may influence sex ratio through its effects on other hormones. For example, testosterone has been associated with male-biased ratios, and corticosterone may have inhibitory effects on testosterone production (Veiga *et al.,* 2004; Pike and Petrie 2005; Rutkowska and Cichon 2006 and Goerlich *et al.,* 2009).

The present results are in harmony with findings of Veiga *et al.,* (2004), who found that increasing the levels of corticosterone in breeding females has also been associated with male-biased sex ratios. Also, Gam *et al.*, (2011) revealed that females of zebra finch injected with 20 mg corticosterone had significantly elevated levels of corticosterone 20 minutes, 1 hour and 2.5 hours post injection and produced significantly more males compared to untreated females. However, our results contradicts those of Hassanein (2019) who reported increases in female percentages in the offspring of Fayoumi hens fed on diets supplemented with 5 and 20 mg prednisolone/ kg diet. In addition, the primary sex ratio was not significantly ($P>0.05$) influenced by corticosterone supplementation at the levels of 20, 30 and 40mg/ kg diet in laying hens (Aslam 2014).

2. Blood parameters

The effects of prednisolone supplementation on blood biochemical parameters are shown in Table (4). The present study indicated that the prednisolone supplementation in diets at levels of 5, 10 and 20mg/kg significantly ($P<0.05$) increased the plasma concentration of albumin as compared to the control group. However, the prednisolone supplementation in diets had no significant ($P>0.05$) effect on plasma total protein, Globulin,A/G ratio, Glucose and cholesterol compared with control group. Albumin represents the largest fraction of total plasma protein in healthy birds. Infectious diseases and inflammatory processes lead to an increase in globulin concentration, which leads to an increase in total protein, but in this study no rise in total protein occurred. It is known that stressors can modify plasma levels of albumin (Van Hunsel *et al.,* 1998). Yang *et al.,* (2015) reported that the corticosterone treatment increased the plasma albumin concentration in the corticosterone - exposed broiler chickens. We notice significant differences albumin as a result of increasing prednisolone in the blood, and this could be the reason for the differences in albumin concentrations. Moreover, Kim *et al.,* (2015) showed that corticosterone treatment failed to affect globulin concentration in plasma for 47 week-old Single Comb Brown Hy-Line Leghorn laying hens. Also, Scanes, (2009) found that corticosterone led to significant ($P<0.05$) increases in plasma glucose concentrations for chickens. In addition to, Kim *et al.,* (2015) showed that laying hens treated with corticosterone in diets had significantly ($P<0.05$) higher plasma concentrations of glucose.

Table 4. Effect of prednisolone supplementation on biochemical determinations.

Treatment	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	A / G ratio (g/dl)	Glucose (mg/dl)	Cholesterol (mg/dl)
C	5.83±0.47	1.77[b]±0.13	4.07±0.59	0.47±0.09	202.33±2.67	252.67±12.81
T1	5.60±0.16	2.20[a]±0.04	3.40±0.12	0.64±0.02	203.00±4.77	243.80±22.29
T2	5.50±0.13	2.16[a]±0.09	3.34±0.12	0.64±0.05	203.80±5.37	230.40±29.40
T3	5.76±0.15	2.30[a]±0.11	3.46±0.12	0.66±0.05	203.00±11.76	232.20±18.38
P. value	0.6798	0.0176	0.1952	0.1153	0.9995	0.9153

[a and b] Means in the same columns with different superscript are significantly different (P≤0.05). **C**= Control (without supplementations), **T1**= 5 mg prednisolone/ kg diet, **T2**= 10 mg prednisolone/ kg diet, **T3**= 20 mg prednisolone/ kg diet

Our results regarding glucose concentrations in blood are in agreement with the findings of Babacanoglu *et al.,* (2013) who showed that there were no significant (P>0.05) differences found in plasma glucose concentrations by corticosterone supplementation in the diet of broiler breeder hens. Similar to glucose, we did not find any changes in cholesterol concentrations due to prednisolone administration which was in agreement with the results obtained by Hassanein, (2019) who found that serum cholesterol was not significantly (P>0.05) affected by feeding Fayoumi hens on a diet supplemented with of 20 mg prednisolone/ kg diet. On the other hand, our results contradict those of Shini *et al.,* (2009), who showed that corticosterone treatment significantly (P<0.01) increased blood levels of glucose, cholesterol and total protein for laying hens as compared to control group. Additionally, Hassanein, (2019) reported that the serum albumin was not significantly (P>0.05) affected in females of Fayoumi chicken's by using of 20 mg prednisolone/ kg diet.

Table 5. Effect of prednisolone supplementation on total leucocytes count, heterophils, band and segmented cells.

Treatment	WBCs	Heterophils percentage	Heterophils Absolute	Band (Staff) Percentage	Band Absolute	Segmented Percentage	Segmented Absolute
C	5.37±1.23	46.67±1.76	2.47±0.48	6.33±1.20	0.36±0.13	40.33±2.19	2.53±0.55
T1	4.44±0.13	43.40±5.50	1.91±0.20	3.60±0.93	0.16±0.03	39.80±4.95	1.72±0.17
T2	4.87±0.18	51.60±1.99	5.52±0.17	4.20±0.97	0.21±0.05	47.40±1.36	2.20±0.11
T3	4.85±0.20	55.20±6.38	2.95±0.54	2.80±0.49	0.14±0.03	49.20±5.07	2.33±0.23
P. value	0.5661	0.3414	0.2663	0.1203	0.1091	0.2923	0.1721

C= Control (without supplementations), **T1**= 5 mg prednisolone/ kg diet, **T2**= 10 mg prednisolone/ kg diet, **T3**= 20 mg prednisolone/ kg diet. **WBCs**= Total Leucocytes Count

Data in Table (5) show the effects of prednisolone administration in the diets on WBC count, heterophils, (bands and segmented cells). No significant differences were observed in WBC count and heterophils numbers among all groups due to prednisolone administration in the diets. Our results are supported by those of Aengwanich (2007), who found that there were no significant (P>0.05) differences in the total white blood cell count among broilers which fed on diets containing the glucocorticoid dexamethasone at the levels of 1,2,3,4 and 6 mg/ kg diet and those in control group during the period of 21 to 42 day of

age. However, our data disagree with Gross *et al.,* (1980), who reported significant increases in the number of heterophils in broilers fed on diets supplemented with corticosterone at the level of 30 mg/kg feed. Also, Flaming *et al.,* (1994) reported that injection of 2mg dexamethasone sodium phosphate/ kg 48 and 24 hour before immune function testing significantly ($P<0.05$) increased neutrophil in pigs compared with control (0 dexamethasone). Similarly, Anderson *et al.,* (1999) showed that total number of WBCs was significantly ($P<0.05$) increased in cattle when injected by Short-acting dexamethasone (dexamethasone sodium phosphate 0.08 mg/kg) followed 37 h later by long-acting dexamethasone (dexamethasone-21 isonicotinate 0.25 mg/kg). Additionally, Puvadolpirod and Thaxton (2000) found that using of corticosterone in broiler led to significant ($P<0.05$) increase in total white blood cell count in chickens. In addition to, Daves, (2005) stated that increases in glucocorticoid hormones leads to an increase in the number of heterophils for birds in circulation. Also, Aengwanich, (2007) showed that heterophils of the broilers that received dexamethasone at 1, 2, 3, 4 and 6 mg kg^{-1} in their diets were significantly ($P<0.05$) increased than the control group. Also, Andrew and John (2010) stated that glucocorticoid hormones led to significant ($P<0.05$) increase in the number of neutrophils (or heterophils in birds and reptiles) in circulation for Salamander (Ambystoma talpoideum). Moreover, Ahmed *et al.,* (2019) indicated that the number of WBCs and neutrophils cells were significant ($P<0.05$) lower in group of dexamethasone compared with control group for rabbits.

Conclusion

From the current study we can conclude that the addition of prednisolone in feed at levels of (5, 10 and 20 mg prednisolone/kg feed) changed the initial sex ratio in the offspring of broiler breeders (Arbor-Acres plus); where the number and percentage of males in the offspring increased significantly ($P\leq0.05$) at the level of (20 mg prednisolone/kg feed) and the number and percentage of males increased in the levels (5 and 10 mg prednisolone/kg feed) but without significant in the statistical analysis compared to the control group the final result, adding prednisolone at a level of 20 mg / kg feed gives the best result for changing the sex ratio in terms of males, and this is the aim of the study.

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محاولة لتغيير نسبة الجنس الأولية في نسل أمهات دجاج اللحم (أربور ايكرز بلس) بإضافة البريدنيزولون في العلف

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الملخص

تمت دراسة تأثير تغذية أمهات دجاج اللحم (أربور ايكرز بلس) على العلائق المحتوية على مستويات مختلفة من مركب (بريدنيزولون) على النسبة الجنسية الأولية للنسل. تم استخدام ١٣٢ طائر، عمر ٥٩ أسبوعًا من سلالة أربور ايكرز بلس، بحالة صحية ممتازة وتم تحصينها، ووزنت بشكل فردي، ثم وزعت على أربعة معاملات. اشتملت كل معاملة على ثلاثة مكررات بكل منها ١١ طائرا (١ ذكر + ١٠ إناث). تم تغذية جميع الطيور في المجموعات من ١ إلى ٤ على العليقة الأساسية مضافا لها مركب البريدنيزولون بمستويات ٠ و ٥ و ١٠ و ٢٠ ملجم/ كجم علف، على التوالي، لمدة ٤٥ يومًا. تم جمع البيض لمدة ٣٠ يوم وتم تفريخه عند درجة حرارة ٣٧.٨ درجة مئوية ورطوبة نسبية ٦٥٪. تم تحديد جنس الكتاكيت الفاقسة عند الفقس عن طريق الريش. أظهرت النتائج أن الطيور التي تغذت على العلائق المحتوية على مستويات ٥ و ٢٠ ملجم بريدنيزولون / كجم علف لها نسبة ذكور أعلى معنويا ($P < 0.05$) في نسلها مقارنة بمجموعة المقارنة. لم يكن لمركب البريدنيزولون أي تأثير على معظم مقاييس الدم قيد الدراسة فيما عدا أنها زادت بشكل ملحوظ من تركيز الألبيومين. ويمكن إستنتاج أن اضافة مركب البريدنيزولون بمستويات ٥ و ٢٠ ملجم بريدنيزولون/ كجم علف غيّرت النسبة الجنسية في نسل أمهات الدجاج اللحم.