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EFFECT OF INDUCED MOLTING ON EGG QUALITY AND SOME BLOOD CONSTITUENTS IN HY-LINE HENS

BY

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ABSTRACT

The present study aimed to investigate the effect of different molting procedures on the post molt egg quality and some blood plasma constituents. Two hundred and seventy Hy-Line laying hens aged 60 weeks were randomly chosen from a large commercial flock. All hens were approximately of an equal body weight and similar performance.

Birds were divided into three groups. Birds of the first group (30 birds) were fed ad-libitum and considered as control. The second group (120 birds) was force molted by adding 1% zinc oxide on diet for 14 days. While birds of the third group (120 birds) were force molted by feed restriction (25%) for 7 days then fasting fore subsequent 7 days.

At the end of the force molting treatments (14 days) when hens completely ceased egg production, the 2nd and 3rd groups were equally divided into 4 subgroups (30 birds each) and injected as follows:-1-Distilled water (1 ml) for 6 days. 2- Estradiol 17 ß (10 mg/ml) for 6 days. 3- Indomethacin (10 mg/ml) for 3 days then Bromocriptine (10 mg/ml) for 3 days. 4- Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days.

Results obtained indicated that: Injecting fast molted hens with either estradiol 17β or HCG increased shell thickness, yolk index, plasma albumen and plasma cholesterol. Fast molted hens injected with HCG improved Haugh units score and increased plasma total lipids and calcium. However, injecting fast molted hens with estradiol 17β increased the levels of plasma total protein, globulin and inorganic phosphorus. From this study, it could be recommended to use fasting to force laying hens to rest and injected with either estradiol 17 ß (10 mg/ml) or HCG (50 IU) to improve internal egg quality of laying hens during the second laying cycle.

INTRODUCTION

As laying hens aged, egg production and egg quality decreases. Induced molting is an important economic tool used by the egg industry to recycle an aging layer flock. Egg producer can impose an induced molt on older hens that increased egg productivity and decreased hen mortality compared with non-molted hens of the same age (Golden *et al.*, 2008). There are many methods to induce molt, but feed removal until hens lose a specific weight is the most prevalent molt strategy (Holt, 2003). It has been adopted by the commercial egg industry to induce molt because it is the easiest method to apply and produce the best results (Webster, 2003). Feed deprivation stimulates multiple egg- laying cycles in laying hens (Moore *et al.* (2004) and Woodward *et al.*, 2005).

The use of various levels of dietary zinc (as zinc oxide) for inducing pauses in egg production had been reported by several researchers (Shippee *et al.*, 1979; Cantor and Jonson, 1984; Hussein *et al.*, 1988 and Reddy

et al., 2008). The action of zinc for inducing pauses in egg production may be a result of reducing feed intake (Gibson *et al.*, 1982 and Berry and Brake, 1985).

Force molting resulted in better egg quality traits after molting (Ghatas, 1994; Awadin, 1998; Bar *et al.*, 2003 and Salem *et al.*, 2005) and also affected plasma blood constituents (Ali, Mervat *et al.*, 1999; Peeples *et al.*, 2004 and Salem *et al.*, 2005).

Plasma estradiol decreased when molting was induced, (Elaroussi *et al.*, 1993). They added that, reproduction ceased when the estrogen Antiguans (tamoxifen) was administrated to laying hens. Plasma estradiol increased with increasing estradiol (E_2) dosages applied (Qin and Klandorf, 1995). Estradiol reduced feed intake and fitness, increased plasma T_3 and T_4 without affecting the resting metabolic rate, raised plasma total lipids and reduced fat deposition in its depots sites to increase its availability for yolk production (Jaccoby *et al.*, 1995).

Indomethacin inhibits prostaglandin biosynthesis (Seeley and Rodny, 1983; Murakami *et al.*, 1991; Mazes and Hidas, 1992 and Magdi, 1993). This inhibitory effect leads to blockage of ovulation. Prostaglandins play a role in ovulatory process within the ovary (Armstrong and Grinwich, 1972; Yang *et al.*, 1973 and 1974 and Wallach *et al.*, 1975). Wallach *et al.* (1975) noted that, PGF2α injection caused not only ovulation, but also induced oocyte maturation

Bromocriptine is an inhibitor of prolactin (Magdi, 1993). Parker, (1979) reported that, bromocriptine (a dopamine against) is used widely for treatment of prolactinomas. In addition, Buys *et al.* (1990) noted that, a high dopamine level inhibits prolactin secretion. Vander *et al.* (1977) found that, bromocriptine induced ovulation. Reddy *et al.* (2008) noted that, birds fed with bromo-criptine significantly reduced the prolactin concentration, increased estrogen and progesterone.

The aim of the current study was to detect the effect of different molting procedures and some hormonal treatments on the post molt egg quality and some blood plasma constituents.

MATERIALS AND METHODS

The present study was carried out at the Poultry Research Farm belonging to Animal Production Department, Faculty of Agriculture, Benha University. Two hundred and seventy Hy-Line laying hens aged 60 weeks were randomly chosen from a large commercial flock. All hens were approximately of an equal body weight (Mean ± S.E) and similar performance. Birds were leg banded, and divided into three groups. Birds of the first group (30 birds) were fed ad-libitum and considered as control. The second group (120 birds) were force molted by adding 1% zinc oxide on diet for 14 days. While, those of the third group (120 birds) were force molted by feed restriction (25%) 7 days then fasted for subsequent 7 days, respectively. When hens of second and third groups completely ceased egg production, nine experimental groups of 30 hens each were formed and treated as shown in Table (1) to detect the response of molted hens to the hormonal treatments investigated. All groups were housed in floor pens at a density of 5 hens / m^2. All birds were reared under the same managerial and hygienic conditions and fed laying ration as indicated in Table (2).

Shell thickness was measured to the nearest 0.01 mm, Haugh units (H.U) calculated according to (Haugh, 1937) and yolk index was also calculated just before molt and at 4, 8, and 16 weeks after molt in eggs of different experimental groups using the following formulas:

$$H.U = 100 \log (H+7.57-1.7W^{0.37})$$

Whereas:

H= Observed albumen height in millimeters.

W= Observed egg weight in grams.

$$\text{Yolk Index (Y.I)} = \frac{\text{Yolk height (mm)}}{\text{Yolk Diameter (mm)}} X100$$

Table (1): Experimental design and number of birds

Treat-ment No.	Molt induction method	Post-molt hormonal treatments
1	Non molted (n=30)	Control
2	1% dietary zinc oxide for 14 days (n=120)	Injection with 1 ml distilled water (d.w.) for 6 days (n=30)
3		Injection with 10 mg/1 ml (d.w).estradiol 17 ß for 6 days (n=30)
4		Injection with 10 mg/1 ml (d.w.) Indomethacin for 3 days followed by 10 mg Bromocriptine for 3 days (n=30)
5		Injection with Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days (n=30)
6	Feed restriction (25%) for 7 days followed by fasting for further 7 days (n=120)	Injection with 1 ml distilled water (d.w.) for 6 days (n=30)
7		Injection with 10 mg/1 ml (d.w.) estradiol 17 ß for 6 days (n=30)
8		Injection with 10 mg/1 ml (d.w.) Indomethacin for 3 days followed by 10 mg Bromocriptine for 3 days (n=30)
9		Injection with Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days (n=30)

Table (2): Formula and calculated nutritional values for the experimental diets

Ingredients	%
Yellow corn	62.00
Soybean meal (44%)	12.50
Layer concentrate (44%)	10.00
Wheat bran	9.50
Limestone	6.00
Calculated analysis:	
Crude protein %	16.34
Metabolizable energy (K cal/kg diet)	2822.6
Calcium %	3.17
Total phosphorus %	0.65

Heparinized blood samples were obtained from wing vein of four hens chosen randomly per each treatment for the determination of plasma total protein, albumen, globulin, total lipids, cholesterol, calcium and inorganic phosphorus just before molt, at 2nd week of molt treatments and at 4, 8, and 16 weeks after molt using enzymatic kits (Bio meriex, Laboratories reagent and products, France). Reading was taken using a spectrophotometer adjusted on optimum wave length for each plasma components in the laboratories of the Animal Production Department, Faculty of Agriculture, Benha University.

All data were analyzed using the general linear model procedure (GLM) of SAS program (1996) according to the following model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{IJ} = The observation of the j^{th} individual in the i^{th} treatment; μ = The overall mean; T_i = The effect of the i^{th} treatment; e_{ij}= the random error.

Test of significance for differences were done using Duncan (1955) multiple comparison option in SAS software (SAS, 1996).

RESULTS AND DISCUSSION

1-Traits of egg quality:

1-1- Shell thickness:

Data presented in Table (3) showed shell thickness values in all experimental groups at all intervals. It is worthy notice that detecting the effect of force molting methods could be achieved through comparing the results of control, force molted hens via zinc oxide injected with distilled water and their corresponding fast molted hens. Differences among other groups are mainly due to hormonal treatments within each force molting treatment.

Shell thickness was increased in eggs obtained from hens molted by fasting and injected with distilled water, while it decreased in their corresponding force molted via zinc oxide at all periods of estimation. These results disagreed with those of Bar *et al.* (2003) who reported that, shell thickness was significantly ($p<0.05$) increased by zinc oxide (2.5% zinc) molting treatment.

Injecting fast molted hens with estradiol 17β significantly increased shell thickness averages after molting at 8th week and at the end of the experimental period when compared with other treatments applied or control. These results disagree with those reported by Qin and Klandorf (1995) who stated that, estradiol 17 β had no significant effect on egg shell thickness or any improve in egg shell quality.

Eggs laid by fasted hens injected with HCG had significantly the highest average of egg shell thickness at the 4th week after molting when compared with other hormonal treatments applied.

1-2-Haugh unit:

As shown in Table (3) Haugh units sharply increased after molting reached its highest score at 4th week and remained approximately constant at 8th week, then it slightly decreased up to the end of the experimental period at values above these recorded just before molting treatments. These results agree with those reported by Alodan and Mashaly (1999) who found that, inducing molting increased Haugh units' value of laid eggs.

Differences in Haugh units score between force molted hens by fasting and injected with distilled water and their corresponding force molted via 1% zinc oxide at all experimental intervals were not significant. It leads to observe that, molt induction method had insignificant effect on Haugh units. Salem *et al.* (2005) concluded the same result. In addition, Berry and Brake (1987); Soliman (1993) and Zapata and Gerant (1995) reported that, no significant effects on egg quality traits due to force molting methods.

Injecting fast molted hens with HCG increased the average of Haugh units value compared with that of eggs laid by all hormonal treatments and non-molted hens.

1-3-Yolk index:

Data presented in Table (3) showed yolk index values in all experimental groups at all intervals of estimation. After molting, yolk index increased in all experimental groups with different rates. Yolk index value increased significantly with higher rate in eggs laid by fast molted hens injected with distilled water when compared with their corresponding of force molted hens by applying zinc oxide (5.8%) or those of non-molted hens (3.9%) during 4th week after molting. These results lead to observe that, molt induction method had significant effect on yolk index value. This result agreed with those reported by Ibrahim *et al.* (2002) who stated that, treatment of force molting affected significantly on yolk index.

Fast molted hens injected with HCG or estradiol 17β, respectively had the highest values of yolk index when compared with other hormonal treatments applied or those of non-molted ones at 4th week after molting. At 8th week, fast molted hens injected with Indo. +Brom. had significantly the highest value when compared with other treatments applied or control.

Force molted groups of hens injected with HCG recorded significantly the lowest values of yolk index at the end of the experimental period.

Table (3): Shell thickness (mm), Haugh units score and yolk index (%) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments			After molting period (weeks)								
					4			8			16		
Molt induction methods	Hormonal treatments	S.T.	H.U.	Y.I.	S.T.	H.U.	Y.I.	S.T.	H.U.	Y.I.	S.T.	H.U.	Y.I.
Non-molted	Control	34.6d	82.3	38.8cd	33.3d	96.3ab	44.6c	31.9d	98.1	46.7c	31.8e	90.9c	43.9bc
Zinc oxide	Distilled water	33.5g	82.8	39.2bcd	31.3h	96.2ab	42.7e	28.5h	98.5	44.3d	31.0f	92.8ab	46.0a
	Estradiol 17β	35.5b	73.7	39.5bc	33.2e	98.5a	44.0cd	30.5g	98.5	43.8d	33.0c	92.9ab	45.8a
	Indomethacin + Bromocriptine	33.8e	82.9	39.0cd	31.7g	95.1ab	44.5c	32.8b	98.5	44.5d	33.7b	89.2c	44.8b
	HCG	33.7f	83.6	41.0ab	30.5i	98.5a	43.2de	30.5g	98.5	48.2b	29.7g	91.3bc	42.2d
Fasting	Distilled water	36.3a	89.2	36.5e	34.5b	98.5a	48.5a	32.7c	98.5	48.0b	32.2d	95.0a	46.3a
	Estradiol 17β	35.3c	82.3	38.3d	33.8c	94.5b	48.0a	33.0a	96.4	46.8c	35.8a	93.5ab	44.7b
	Indomethacin + Bromocriptine	33.7f	81.5	41.7a	32.7f	98.5a	46.2b	31.7e	98.5	49.7a	29.8g	92.8ab	43.7c
	HCG	32.3h	82.8	41.5a	34.5b	98.5a	48.7a	30.7f	98.5	46.5c	28.3h	93.8ab	42.2d
SEM		1.17	4.2	0.2	1.17	4.2	0.2	1.17	4.2	0.2	1.17	4.2	0.2

a,b,c...: Means in the same column with common superscripts are not significant different ($P<0.05$)
S.T=Shell thickness, H.U. =Haugh units, Y.I. =Yolk index

3-1- Blood plasma constituents:

3-1- Plasma protein fractions:

Table (4) showed plasma total protein, albumen and globulin levels in all experimental groups at all intervals. Plasma total protein and albumen levels decreased in almost experimental groups of hens at the 2nd week of molt induction treatments. The depression in plasma protein level which happened directly after force molting may be due to the absence of estrogen. Force molted hens by zinc oxide injected with distilled water had the highest decrease in plasma total protein when compared with their corresponding fasted ones. This was quite logically due to the effect of force molt induction method.

Plasma total protein level increased in all experimental groups with different rates at 4th week after molting. It had no constant trend up to the 8th week, and then decreased towards the end of the experimental period. Similar results were observed by Ibrahim *et al.* (2002) who found a significant decrease in the concentration of plasma total protein, albumen and globulin after treatments. Brake and Thaxton (1979) noticed that, plasma total protein did not exhibit consistent trend.

Fast molted hens injected with estradiol 17β had significantly the highest plasma total protein level at the 4th week after molting and at the end of the experimental period when compared with all treatments applied or control. These results agreed with those obtained by Whitehead (1995) who stated that, estradiol increased plasma protein concentration. Estrogen may allow the liver to more efficiently produce elevated level of plasma protein.

Plasma albumen level slightly increased in all experimental groups and reached its highest level at 8th week, and then it sharply decreased reached its lowest level at the end of the experimental period.

Fast molted hens injected with HCG had significantly the highest level of plasma albumen at 4th and 8th week after molting when compared with other hormonal treatments applied or those of non-molted group. On the other hand, the highest level at the end of experimental period was observed in fasted hens injected with estradiol 17β.

Plasma globulin level had no constant trend along the experimental periods (Table, 4). It decreased significantly in force molted hens by applying zinc oxide which injected with distilled water at 8th and 16th week after molting when compared with their corresponding fasted ones, however opposite results where observed at 4th week after molting.

Fast molted hens injected with estradiol 17 β had significantly the highest level of plasma globulin at 4th week after molting when compared with all treatments applied. However, the highest level at the end of the experimental period was found in those molted by fasting and injected with Indo. +Brom.

3-2- plasma total lipids and cholesterol:

Data presented in Table (5) showed plasma total lipids and cholesterol levels for different experimental groups at all intervals of estimation. Plasma total lipids level decreased at the 2nd week of molt induction with different rates in all experimental groups.

Force molted hens by applying zinc oxide that injected with Indo. +Brom. had significantly the higher level (1739.7 mg/dl) of plasma total lipids at 2 weeks of molt treatment compared with those of different treatments applied and control groups, this difference was quite logically attributed to force induction method.

After molting, plasma total lipids level increased gradually and recorded its highest level at 8th week, then it decreased slightly up to the end of the experimental period. Changes in plasma total lipids may be correlated with the differences in metabolic rate which may be individually varied. Results obtained agreed with those of Wills *et al.*, (1972) who stated that, total lipids was at its lower level when laying commences.

Table (4): Plasma total protein, albumen and globulin level (mg/dl) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments			At 2 weeks of molt treatments			After molting period (weeks)								
								4			8			16		
Molt induction methods	Hormonal treatments	T.P.	Alb.	Glo.	T.P.	Alb.	Glo.	T.P.	Alb.	Glo.	T.P.	Alb.	Glo.	T.P.	Alb.	Glo.
Non-molted	Control	6.10d	4.75d	1.38c	5.44bc	3.91c	1.48c	6.90c	4.41cd	2.36e	5.61c	4.62d	1.24c	5.12c	2.97b	2.10f
Zinc oxide	Distilled water	7.17b	4.45f	2.71a	5.17cd	3.11f	2.06a	6.76c	4.64b	3.12d	5.77bc	5.15b	0.62f	3.90e	2.73cd	1.16g
	Estradiol 17β	4.89f	3.74g	1.15d	5.33c	3.35e	1.98a	5.81d	3.94e	1.91f	5.85bc	4.40c	1.26c	5.17c	2.93b	2.23e
	Indomethacin + Bromocriptine	6.40cd	5.03c	1.37c	5.74b	4.06bc	1.68b	7.69a	3.86e	3.80b	5.94bc	3.75f	2.19b	5.07c	2.60d	2.47c
	HCG	4.79f	3.80g	1.06de	4.14e	3.54d	0.59f	7.69a	4.28d	3.41c	5.14d	4.44e	0.70f	5.27bc	2.93b	2.33d
Fasting	Distilled water	6.60c	4.6e	2.00b	6.15a	4.16b	1.99a	5.93d	5.00a	0.92h	6.01b	5.09b	0.94d	5.56ab	2.91b	2.65b
	Estradiol 17β	5.70e	5.37b	0.33f	5.44bc	4.10b	1.05d	7.86a	3.87e	3.99a	4.92d	4.61d	1.21c	5.81a	4.27a	0.65h
	Indomethacin + Bromocriptine	7.78a	6.36a	1.42c	6.22a	4.50a	1.72b	7.31b	4.48c	0.78i	5.25d	4.93c	2.38a	5.66a	2.81c	2.85a
	HCG	6.10d	5.09c	1.00e	4.97d	4.11b	0.86e	5.97d	4.48c	1.49g	6.81a	5.93a	0.89e	4.61d	2.42e	2.19ef
SEM		0.23	0.13	0.23	0.23	0.13	0.23	0.23	0.13	0.23	0.23	0.13	0.23	0.23	0.13	0.23

a,b,c...: Means in the same column with common superscripts are not significant different ($P<0.05$)

T.P. =plasma total protein, Alb. =plasma albumen, Glo. = plasma globulin

Table (5): Plasma total lipids and cholesterol level (mg/dl) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments		At 2 weeks of molt treatments		After molting period (weeks)					
						4		8		16	
Molt induction methods	Hormonal treatments	T.L.	Chol.	T.L.	Chol.	T.L.	Chol.	T.L.	Chol.	T.L.	Chol.
Non-molted	Control	1943.0d	299.00d	1339.1de	202.19e	1628.2e	218.93e	2370.5c	101.36c	1820.6c	138.44b
Zinc oxide	Distilled water	2363.2b	231.80g	1227.5f	162.61g	1388.5g	218.05e	3801.3a	83.48e	1748.1d	106.30g
	Estradiol 17β	1441.2h	317.89b	1321.3e	275.10a	2024.7a	211.13f	2320.5d	92.37d	2061.4b	111.43f
	Indomethacin + Bromocriptine	1517.8g	327.40a	1739.7a	208.31d	1737.0d	141.74h	2307.9d	76.82f	1478.3g	116.76e
	HCG	1636.8f	280.43e	1489.4b	137.78h	2111.0b	233.06d	2041.6f	83.36e	1665.3e	131.43cd
Fasting	Distilled water	2081.8c	330.60a	1028.0h	220.38c	1111.0h	186.09g	2238.6e	145.17b	2120.3a	128.57d
	Estradiol 17β	2106.4c	303.70c	1416.9c	191.12f	1787.0c	265.08a	1782.8g	81.68e	1553.6f	277.10a
	Indomethacin + Bromocriptine	1873.4e	268.80f	1118.8g	188.86f	1398.8g	258.74b	2045.4f	91.71d	1828.2c	105.14g
	HCG	2518.8a	330.93a	1372.1d	232.28b	1466.7f	237.10c	2424.1b	156.20a	2106.9a	133.40c
SEM		27.3	2.2	27.3	2.2	27.3	2.2	27.3	2.2	27.3	2.2

a,b,c...: Means in the same column with common superscripts are not significant different (P<0.05)

T.L. = plasma total lipids, Chol. = plasma cholesterol.

Force molted hens by zinc oxide and injected with distilled water had the higher rate of increase in plasma total lipids at 4th and 8th week after molting when compared with their corresponding fasted ones. Opposite results where observed at the end of the experimental period. This was quite logic due to molt induction method effect.

Force molted hens by zinc oxide and injected with HCG significantly increased plasma total lipids at the 4th week after molting. However, injecting fast molted hens with HCG caused the highest rate of increase in plasma total lipids from 8th to 16th week after molting when compared with all hormonal treatments applied.

Force molting sharply decreased plasma cholesterol level at the 2nd week of molt induction treatments. Fast molted hens injected with distilled water had significantly increased plasma cholesterol level at 2th week of molt treatment when compared with their corresponding fed 1% zinc oxide. This lead to observe that applying 1% zinc oxide as a force molting method decreased significantly plasma cholesterol level when compared with fasting.

Plasma cholesterol level had no trend up to the 4th week after molting; it sharply decreased reached its lowest level at 8th week, then, increased to reach its highest level at the end of the experimental period.

Fast molted hens injected with HCG had significantly the highest level of plasma cholesterol at the 8th week. However, fast molted hens that injected with estradiol 17 β had the highest levels at 4th week and at the end of the experimental period. These results agreed with those reported by Rath *et al.*, (1996) who found that, injection with estradiol caused an increase in plasma cholesterol level.

3-3-Plasma calcium and inorganic phosphorus:

Data presented in Table (6) showed that, plasma calcium level decreased and recorded its lowest level at the 2nd week of molt induction treatments with different rates in all experimental groups. This was more pronounced in fast molted hens that injected with distilled water when compared with their corresponding molted via zinc oxide. These results agree with those of Brake and Thaxton (1979) who reported that, plasma total calcium and inorganic phosphate decreased significantly at the duration of the pause in egg production.

Plasma calcium level sharply increased at 4th week after molting. However, it decreased at 8th week, and then it slightly increased up to the end of the experimental period. Results obtained are in agreement with those of Roland and Brake (1982) who noted that, force molting increased plasma calcium. They attributed this result to improvement occurred in calcium absorption and mobilizetion. Salem *et al.* (2005) added that, Plasma calcium increased with relative of the egg production after molting period, which may be attributed to the effect of the increase in estrogen during that period which increase calcium release in blood stream.

Fast molted hens injected with HCG had significantly the highest levels of plasma calcium at 4th week after molting when compared with other hormonal treatments applied. On the other hand, fast molted hens injected with estradiol 17β recorded significantly the lowest levels at 8th week and at the end of the experimental period.

Plasma inorganic phosphorus levels in all experimental groups at all intervals of determination are shown in Table (6). At the 2nd week of molt induction treatments, plasma inorganic phosphorus level decreased in hens force molted by zinc oxide and then injected with distilled water at a rate of 0.8 mg/dl. when compared with their corresponding fasted ones. This result reflects the effect of the force induction method.

Plasma inorganic phosphorus had no trend; however it increased in almost experimental groups at the 4th week after molting. It fluctuated between decreasing and increasing toward the end of the experimental period.

Table (6): Plasma calcium and inorganic phosphorus level (mg/dl) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments		at 2 weeks of molt treatments		After molting period (weeks)					
						4		8		16	
Molt induction methods	Hormonal treatments	Cal.	phos.	Cal.	phos.	Cal.	phos.	Cal.	phos.	Cal.	phos.
Non-molted	Control	13.4^{bc}	7.0b^{cd}	12.0a	6.7d	17.3ab	7.3e	15.1b	5.4b	15.9d	7.1b
Zinc oxide	Distilled water	13.3bc	7.3ab	10.8b	6.7d	18.0a	7.6d	13.9d	5.7a	17.0c	6.1c
	Estradiol 17β	13.1bc	7.5a	8.5c	8.7b	15.6c	9.1a	16.6ab	4.2	19.3a	6.2c
	Indomethacin + Bromocriptine	13.9b	7.3ab	8.6c	4.8f	18.0a	9.1a	12.8e	4.5d	18.0b	7.1b
	HCG	12.0c	6.8d	8.7c	4.3g	17.9a	4.2f	16.7a	5.5ab	16.2c	7.2b
Fasting	Distilled water	13.6b	6.8d	10.2b	7.5c	18.0a	7.1e	15.7b	5.6ab	16.7c	7.1b
	Estradiol 17β	13.8b	7.1c	8.2c	6.1e	17.1ab	8.4b	12.4e	4.9c	13.3e	5.0d
	Indomethacin + Bromocriptine	12.5c	7.1c	8.2c	9.1a	16.7b	8.0c	14.6cd	4.1e	16.9c	9.1a
	HCG	15.0a	7.0cd	8.6c	9.1a	18.0a	7.6d	16.3ab	5.1c	18.7ab	7.2b
SEM		0.09	0.1	0.09	0.1	0.09	0.1	0.09	0.1	0.09	0.1

a,b,c...: Means in the same column with common superscripts are not significant different (P<0.05)
Cal. = plasma calcium, Phos. = plasma inorganic phosphorus.

Plasma inorganic phosphorus level reached significantly its highest rate in force molted hens via zinc oxide that injected with either estradiol 17 β, Indo. +Brom. (at 4th week) or HCG (at 8th week). However, fasted hens injected with either Indo. +Brom. or HCG had significantly the highest levels at the end of the experimental period.

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تأثير إحداث القلش الإجباري على صفات جودة البيضة وبعض مكونات الدم فى دجاج الهاى لاين

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استهدف البحث دراسة تأثير استخدام طرق مختلفة لأحداث القلش الإجباري على صفات جودة البيض بعد القلش وبعض مكونات بلازما الدم. استخدم فى هذه الدراسة عدد ٢٧٠ دجاجة بياض من نوع الهاى لاين عمر ٦٠ أسبوع اختيرت عشوائيا من قطيع تجارى كبير. وكانت الطيور متساوية فى وزن الجسم والكفاءة الإنتاجية تقريبا.

قسمت الطيور إلى ثلاث مجاميع- غذيت طيور المجموعة الأولى (٣٠ طائر) حتى الشبع واعتبرت كمجموعة مقارنة، أما المجموعة الثانية (١٢٠ طائر) فقد أجبرت على القلش بإضافة ١% أكسيد الزنك الى العليقة لمدة ١٤ يوم. بينما طيور المجموعة الثالثة (١٢٠ طائر) فقد أجبرت على القلش بتحديد الغذاء (٢٥%) لمدة ٧ أيام ثم التصويم لمدة ٧ أيام أخرى.

عند نهاية معاملات القلش (١٤ يوم) وحينما توقف إنتاج البيض بالكامل تم تقسيم طيور المجموعة الثانية والثالثة كل منها إلى ٤ تحت مجاميع (بكل منها ٣٠ طائر) وتم حقنها كما يلى المجموعة الأولى حقنت بالماء المقطر (١ ملى لمدة ٦ أيام) ، الثانية حقنت بالأستراديول ١٧ بيتا (١٠ ملليجرام/مل) لمدة ٦ أيام والثالثة حقنت بالأندوميزازين (١٠ ملليجرام/مل) لمدة ٣أيام ثم البروموكربتين (١٠ملليجرام/مل) لمدة ٣ أيام أخرى أما التحت مجموعة الرابعة فقد حقنت بالهرمون المنشط للغدد الجنسية (٥٠ وحدة دولية) لمدة ٦ أيام.

دلت النتائج المتحصل عليها على ما يلى: أدى حقن الطيور التى أجبرت على القلش بالتصويم بكل من الأستراديول أو الهرمون المنبه للغدد الجنسية الى زيادة سمك القشرة ،دليل الصفار ، محتوى البلازما من الألبيومين والكولستيرول. أدى حقن الطيور التى أجبرت على القلش بالتصويم والمحقونة بالهرمون المنبه للغدد الجنسية الى تحسين وزيادة محتوى بلازما الدم من الليبيدات الكلية والكالسيوم، بينما أدى حقن نفس الطيور بالأستراديول ١٧ بيتا الى زيادة معنويات بلازما الدم من البروتينات الكلية ، الألبيومين والفوسفور الغير عضوى. من هذه الدراسة يمكن التوصية باستخدام التصويم لإحداث القلش الإجبارى للدجاج البياض مع حقنها بأي من الأستراديول ١٧ بيتا (١٠ ملليجرام/مل) أو الهرمون المنبه للغدد الجنسية (٥٠وحدة دولية) لتحسين صفات الجودة الداخلية للبيض خلال السنة الإنتاجية الثانية للدجاج البياض.