

## **Some Hematological and Histological changes in seminiferous tubules of pigeon (*Columba livia*) that exposed to different periods of light**

بعض التغيرات الدموية والنسجية في النبببات الناقلة للمني لطيور حمام *Columba livia* المتعرضة لفترات إضاءة مختلفة

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### **Abstract:**

Sixty two of male pigeon type *Columba livia* divided into three groups, 24 birds in each group since September to November in 2006 .one of this group exposed to normal period of light, another exposed to long- term period of light , the last one exposed to short-term period of light. The results showed that the body weight of birds increased significantly ( $p<0.05$ ) ,in addition the mean weight of testis , WBC were significantly decreased ( $P<0.05$ ) when exposure to short period of light in compared with other groups. Histological study carried out on seminiferous tubules to measured the outside diameters and counted the germinal epithelial cells(spermatogonia, Round spermatids and Primary spermatocytes) and sertoli cells , the results revealed that the seminiferous tubules diameters was significantly distended ( $P<0.05$ ) with significantly decreased ( $P<0.05$ ) in number of germinal epithelial cell and sertoli cells when exposed to short period of light in compared with other groups.

### **الخلاصة :**

أجريت هذه الدراسة على ٦٢ من ذكور الحمام من نوع *Columba livia* قسمت إلى ثلاثة مجاميع تضمنت كل مجموعة ٢٤ طير واستمرت التجربة لمدة شهرين من شهر أيلول إلى تشرين الأول من العام ٢٠٠٦. تعرضت إحدى هذه المجاميع إلى فترة إضاءة طبيعية وعدت مجموعة سيطرة وأخرى إلى فترة إضاءة طويلة أما المجموعة الأخيرة فتعرضت إلى فترة إضاءة قصيرة. وتم بعدها قياس وزن الطير الكلي، وزن الخصى وقياس بعض المعايير الدموية (WBC, PCV , Hb). كما تم دراسة التأثير النسجي لفترة الإضاءة على قطر النبببات الناقلة للمني وعدد الخلايا المنشئة للنطف (سليفات النطف و الخلايا النطفية الأولية وارومات النطف) وكذلك خلايا سرتولي. أظهرت النتائج حصول زيادة معنوية ( $P<0.05$ ) في وزن الطيور المتعرضة لفترات إضاءة قصيرة مع انخفاض معنوي ( $P<0.05$ ) في وزن الخصى و العدد الكلي لكريات الدم البيضاء مقارنة مع بقية المجاميع. كما لوحظ نسيجيا في هذه المجموعة حصول زيادة معنوية ( $P<0.05$ ) في قطر النبيب الناقل للمني مع انخفاض معنوي ( $P<0.05$ ) في عدد الخلايا المنشئة للنطف وخلايا سرتولي مقارنة مع المجاميع الأخرى.

### **Introduction:**

It was well established that photic stimuli associated with changing day length regulate seasonal cycles of reproduction in bird (Oliver and Bayle, 1982). The light are transmitted from retina to the circadian system of the supra schismatic nuclei (SCN), ultimately reaching the pineal gland where the duration of melatonin secretion determined the timing of seasonal endocrine secretion (Bartenss *et al*, 1993). The ovary and testis effect by increase melatonin secretion (Antigonadal hormone) which cause decrease in the released follicular stimulating hormone (FSH) and leutilizing hormone (LH) from pituitary gland (Ganong, 2005). Histologically the testicular interstitium and mediastinum contains hormone-secreting leydig's cells, this hormone called (testosterone) which caused decrease in the FSH and LH hormones. (Junqueira and Carneiro, 2005) The lesion in hypothalamus gland lead to hypotrophy and disorder in the function of testis due to rise in the level of blood testosterone that cause decreased in the level of (LH) via negative feed back to the pituitary gland (Saldanha *et al*, 2001). Pineal gland in some condition caused rise activity of ganodotropin secretion when exposed to long term of photoperiod, but when pinealectomy lead to occur early of sexual puberty (Ganong, 2005). In rats, hamster and rabbit there is evidence when exposed to dark condition or to short term of light lead to ganodohypotrophy , while pinealectomy lead to regrowth of the gonad . When the blind male rats exposed to continuous

darkness show reduction in the weight of testis , but in blind female rats the darkness cause inhibition of gandotropine hormones secretion and disturbance in growth, return to normal condition by pinealectomy or disconnect the neuropineal gland connection (Witkin *et al* ,1998). .In comparing mammals and birds there are no different in the synthesis of melatonin and daily rhythmus in pineal gland that rise in darkness period.(Wilson,1991).The aim of this research showed the effect of long photoperiod and short on body weight of male pigeon and weight of testis as well as some hematological parameters (Packed cell volume ,hemoglobin estimation and total white blood cell count) and histological study carried out to revealed the effect of light period on the diameters of seminiferous tubules and the numbers of germinal epithelial cells (spermatogonia, Round spermatids and primary spermatocytes ) and sertoli cells .

### **Materials and Methods:**

This experiment performed on three groups of male pigeon type *Columba livia* in one week of age, in the same condition , nutrition and temperature .Each group involved 24 birds as following:

1. exposed to the normal photoperiod represented as a control group.
2. Group(B), exposed to the long photoperiod (24 hours\day).
3. Group(C) ,exposed to the short photoperiod (2 hours\day).

The experiment continued for two months . The mean body weight and testis weighted by sensitive balance .blood samples collecting randomly from slaughtered birds from each group to estimate some blood parameters ,including (Hemoglobin concentration(Hb), Packed cell volume (PCV) and total whit blood cells count(WBC) (Benjamin,1978).

For histological studies , birds were killed by slaughtered , immediately testis was weighted and then excised and preserved in 10% neutral formalin buffer solution , till the preparation of histological section .Tissues were embedded in paraffin and several tissues sections of 5 microns thick were prepared histological section were stained with Hematoxylin-Eosin (H and E) stain .(Luna,1968)

The outside diameters of the fifteen seminiferous tubules in one field measured by light microscope with ocular micrometers lenses as well as sertoli cells (with visible nucleoli ), spermatogonia, round spermatids and primary spermatocytes. Also measured the nuclear diameters of each germ cells type and nucleolar diameters of sertoli cells, these diameters were used to calculate corrected number of each type of germ cells and sertoli cells per tubules cross-section using the Ambergrombie formula (Ambergrombie,1946):

$$\text{Corrected cell counts} = \frac{\text{crud cell counts} \times \text{section thickness}}{\text{Section thickness} + \text{nuclear diameters}}$$

Because sertoli cell nuclei have an irregular shape ,nuclear diameter and not nuclear diameters was used to calculate corrected sertoli cell count.

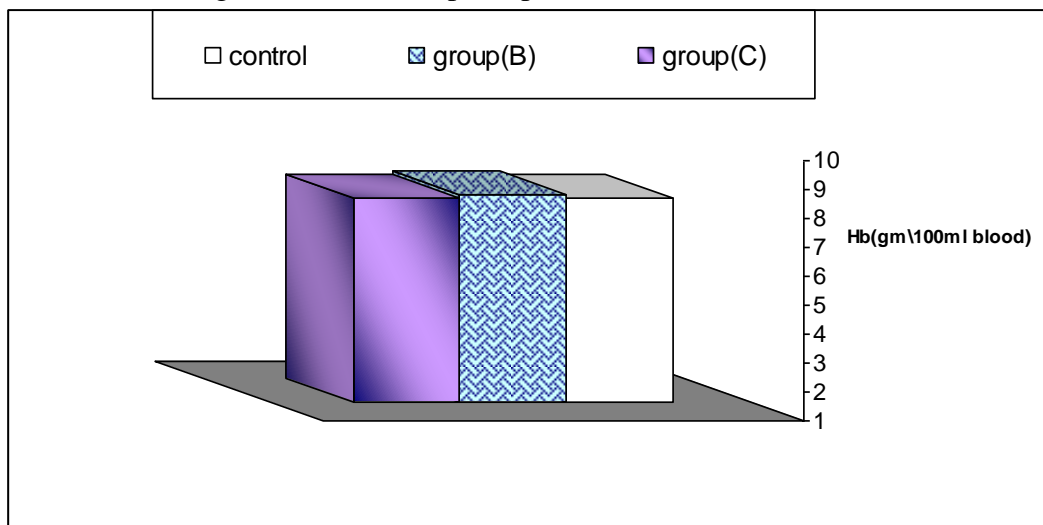
The average numbers of germ cells per sertoli cell were calculated for control and treatment and used for statistical comparison of spermatogenesis in control and treatment.

Statistical analysis used two way analysis of variance (ANOVA)depending on the experimental design between the treatment groups and control (Steel and Torrie,1980)( $P<0.05$ )

### **Results and Discussion**

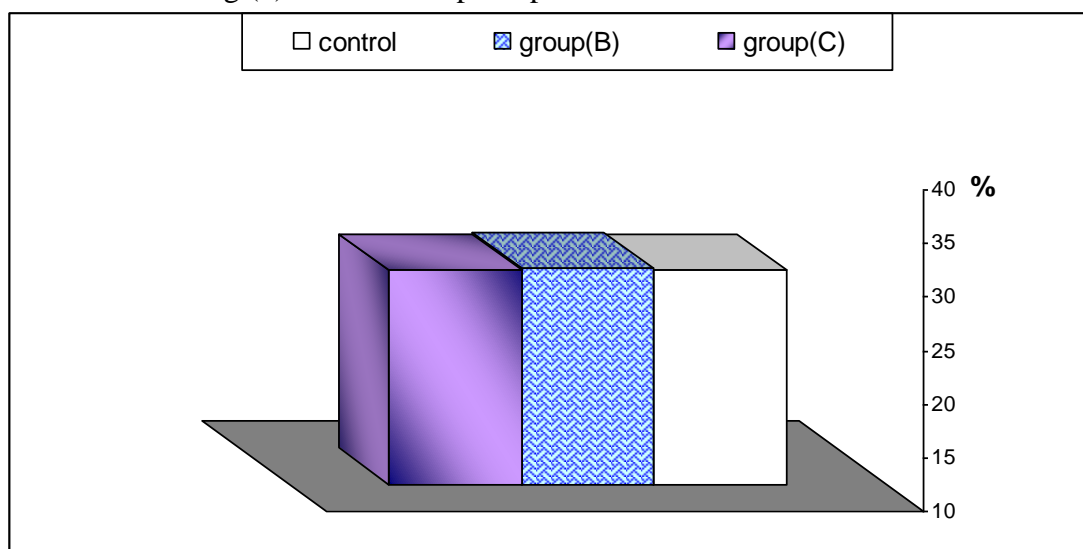
The results shown that the Hb and PCV were normal value in all group (figure 1,2), while the WBC count were decreased significantly ( $P<0.05$ ) in both group (B) and control, in compared with group C(figure 3).this results may be belong to immunsystem of bird effected with shortness or long of photoperiod (Silverman *etal.*,1998).

Fig.(1) revealed the photoperiod effect on Hb of birds



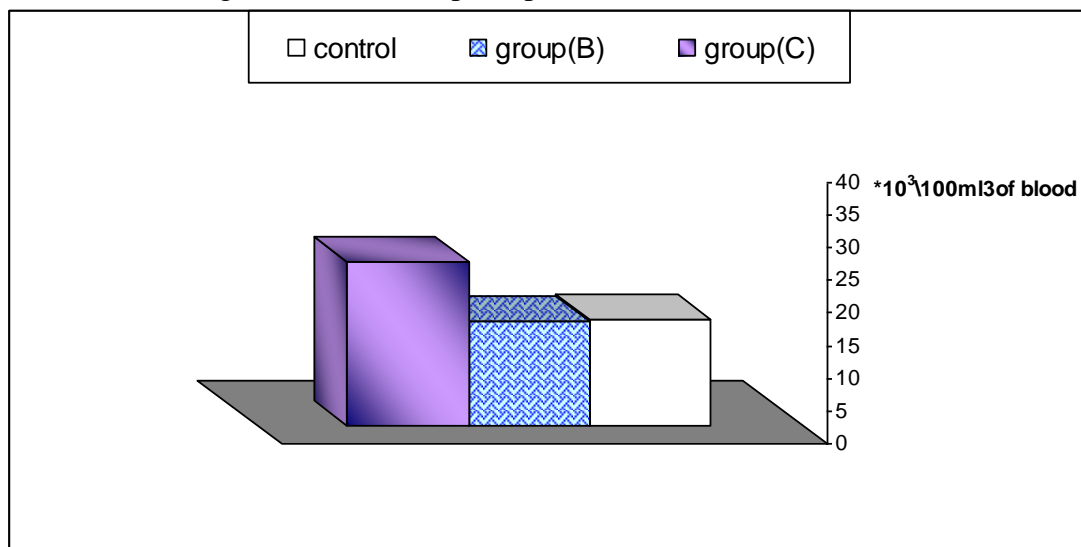
Group B :exposed to long period of light  
Group C :exposed to short period of light

Fig.(2) revealed the photoperiod effect on PCV of birds



Group B :exposed to long period of light  
Group C :exposed to short period of light

Fig.(3) revealed the photoperiod effect on WBC of birds

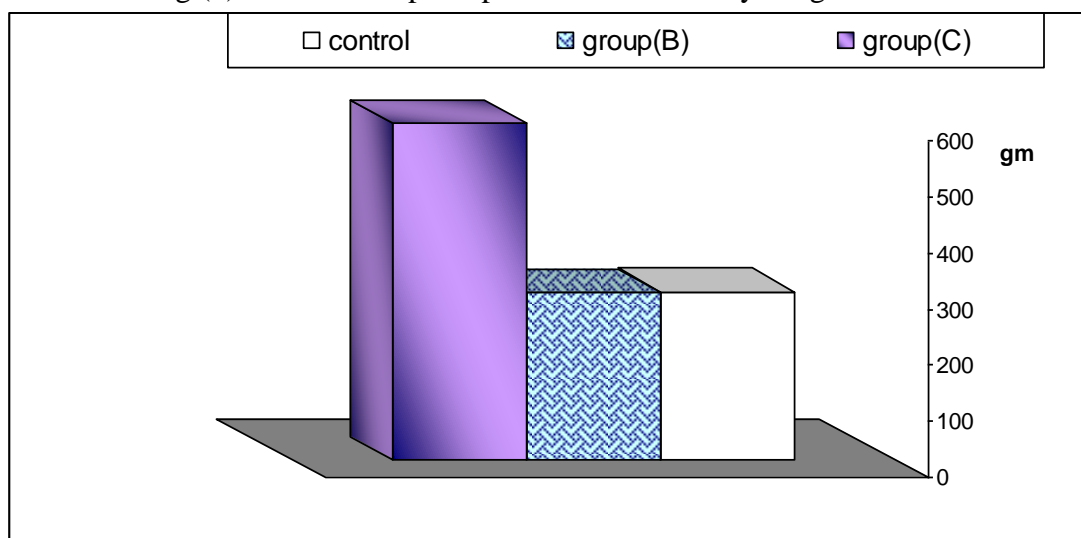


Group B :exposed to long period of light

Group C :exposed to short period of light

The mean body weight were increased significantly ( $P < 0.05$ ), but the mean testis weight decreased significantly ( $P < 0.05$ ) in group C in compared with group B and control (figure 4,5), This finding belong to effect of light and dark on the pineal gland, in group C the short term of photoperiod lead to decreased in the weight of testis organ by increased in the melatonin secretion lead to late in development and maturation of genital gland (Trivedi *et al.*, 2004) with decreased in the flying activity of birds that lead to increase in the body weight.

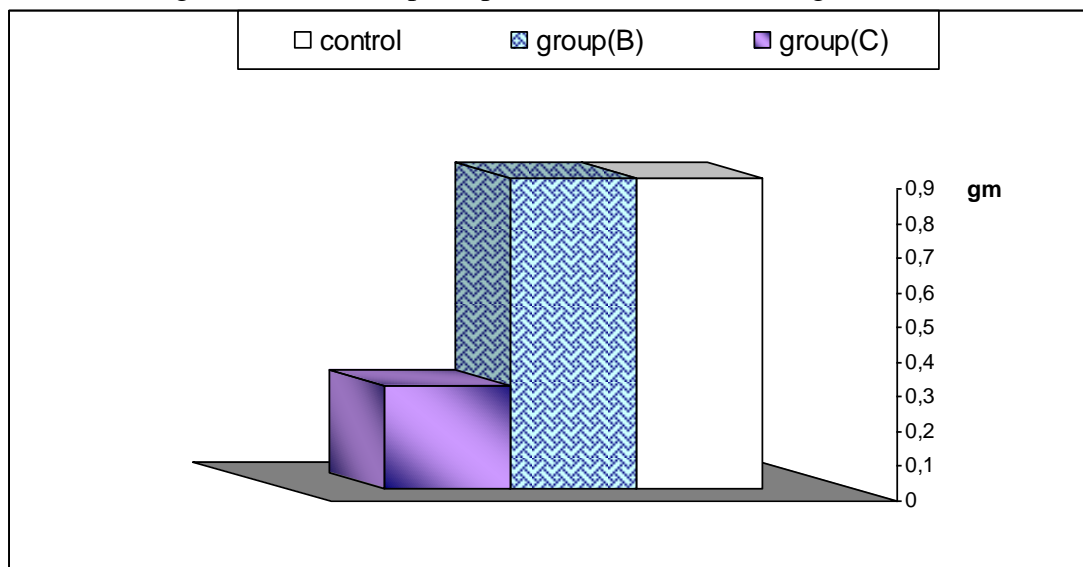
Fig.(4) revealed the photoperiod effect on body weight of birds



Group B :exposed to long period of light

Group C :exposed to short period of light

Fig.(5) revealed the photoperiod effect on testis weight of birds

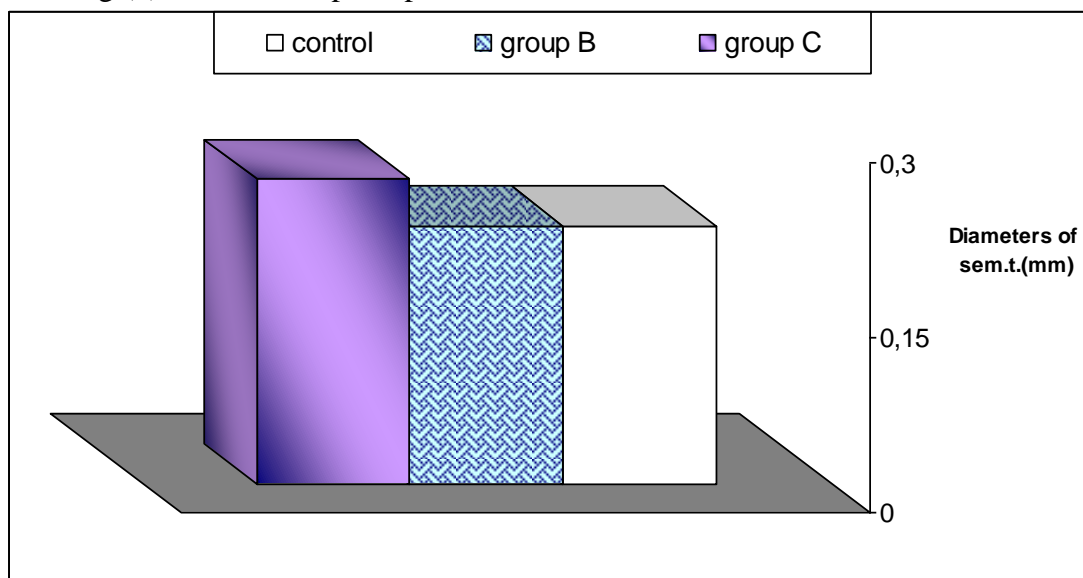


Group B :exposed to long period of light

Group C :exposed to short period of light

The histological finding showed that the seminiferous tubules diameters was significantly distended in group C in compared with control and group B (figure6) with decreased in the numbers of germinal epithelial cells and sertoli cell (figure 7), (figure 8,9).This may be caused by short period of light that lead to stimulate melatonin synthesis which caused inhibition in gonadotropin hormones secretion LH and FSH)that lead to disturbance in spermatogenesis (Ganong ,2005).

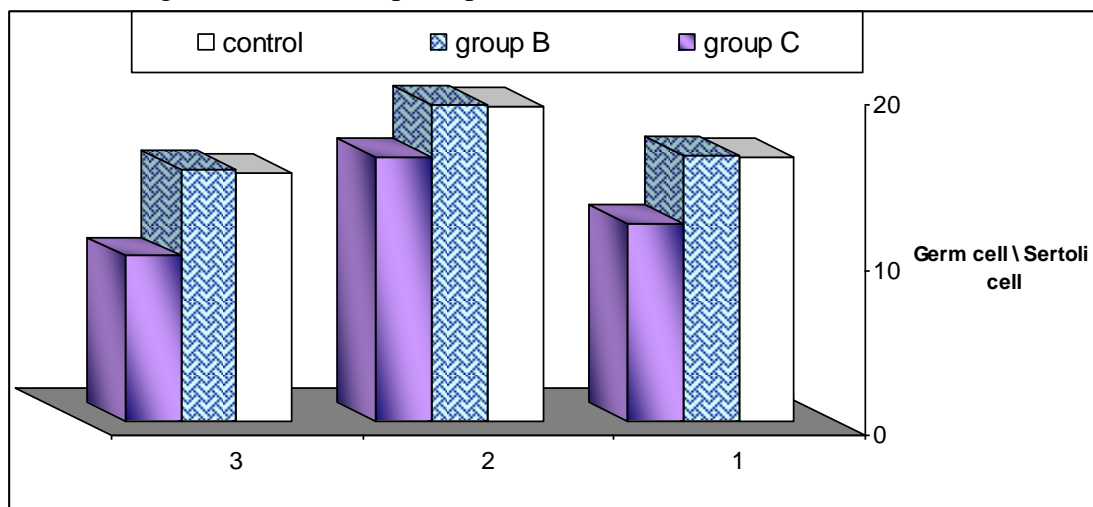
Fig.(6) revealed the photoperiod effect on diameter of seminiferous tubules



Group B :exposed to long period of light

Group C :exposed to short period of light

Fig.(7) revealed the photoperiod effect on Germ cell \ Sertoli cell



Group B :exposed to long period of light

Group C :exposed to short period of light

1: mean Spermatogonia

2: mean Round spermatids

3: mean Primary spermatocytes

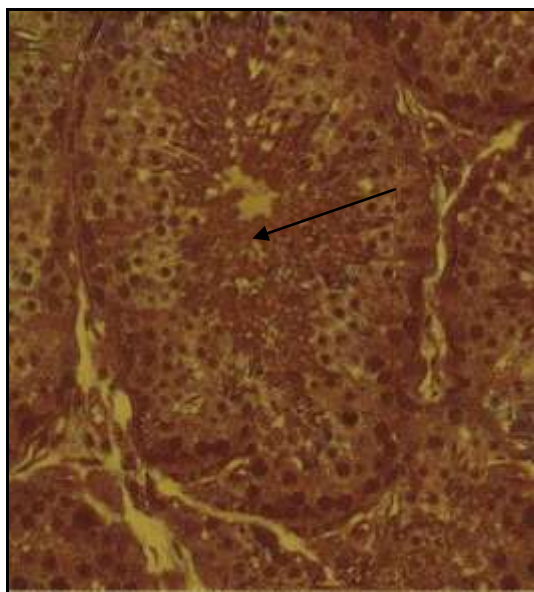


Fig.(8)Seminiferous tubules  
in group (C).X40  
(H&E)

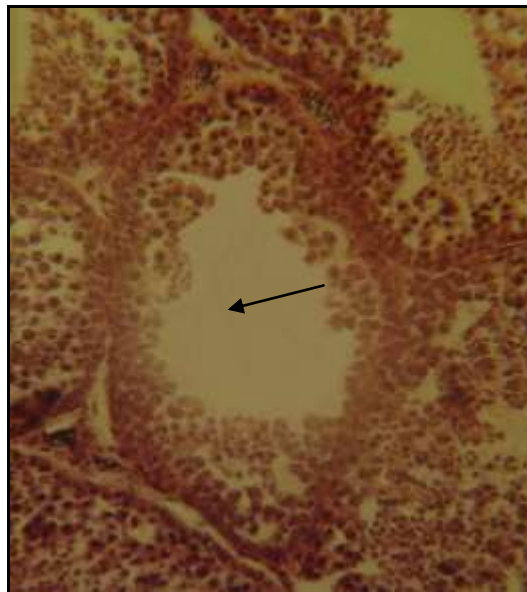


Fig.(9)Seminiferous tubules  
in control.X40  
(H&E)

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