

## The Effects of Waste Products of generators exhausts on Foam Gland in Male Japanese Quail (*contunix conurnix*) Anatomical and Histological study

Reshag A. F.

Dhyaa Ab. Abood

Maysoon A. Ahmed

Department of Anatomy and Histology, College of Veterinary Medicine,  
University of Baghdad, Baghdad, Iraq

### Abstract:

This study had been made to detect the gross and histological changes of cloacal gland (foam gland) in Fourty males of Japanese quail which exposed to waste products of generator exhausts with different periods. The Fourty males Japanese quail were divided into four groups showed that, a mild foam production of cloacal glands with mild atrophy was observed in third group which exposed to exhaust for a period of 20 days. The cloacal glands were atrophied, and no foam production was appeared in the first and second groups which exposed to exhaust for a period of 40 and 60 days, while normal glandular size and heavy foam production was noticed in the fourth group (control group). The histological changes of cloacal gland in the first and second groups revealed atrophy of its secretory units and the lining of these secretory units were flat epithelial cells. Beside, the septa and the interstitial connective tissue were thick. The lining secretory units of the cloacal gland in the third group showed low cuboidal cells with slightly thickened of the lamina properia and the interstitial connective tissue. While the cloacal gland of control group showed features of normal glandular histology were their secretory units lined by simple columnar epithelium. These cells have negative PAS stain granules. The lamina properia in the control group was thick with well vascularized connective tissue.

تأثير مخلفات عادم المولدات على الغدة الرغوية في ذكور طائر السلوى ، دراسة  
تشريحية ونسجية

ضياء عبد الحسين عبود

علي فارس رشك

ميسون عبد القادر احمد

فرع التشريح والأنسجة والأجنة، كلية الطب البيطري، جامعة بغداد، بغداد، العراق

### الخلاصة:

أجريت هذه الدراسة لتشخيص التغيرات العيانية والنسجية للغدة الرغوية في اربعون من ذكور طائر السلوى والتي تعرضت للعادم لمدد مختلفة . قسمت الطيور الى اربعة مجاميع ، اظهرت الغدة

الرغوية في المجموعة الثالثة والتي تعرضت للعدم لمدة عشرون يوما ضمورا طفيفا مع انتاج معتدل للمادة الرغوية. اظهرت المجاميع الاولى والثانية من الطيور والتي تعرضت للعدم لمدة اربعون وستون يوما على التوالي ضمورا وعدم انتاج للمادة الرغوية، بينما كان حجم الغدة الرغوية في طيور المجموعة الرابعة (مجموعة السيطرة) طبيعيا وتتميز الغدة بوفرة الانتاج الرغوي. اظهرت التغيرات النسجية للغدة الرغوية في المجموعة الاولى والمجموعة الثانية ضمورا واضحا في وحداتها الافرازية وتبطن بخلايا مسطحة مع تثخن في الحواجز والنسيج الضام البيني. اما المجموعة الثالثة فتبطن وحداتها الافرازية بخلايا ظهارية مكعبة واطنة مع تثخن طفيف للصفحة الاساسية والنسيج الضام البيني، في حين اظهرت الوحدات الافرازية للغدة في طيور مجموعة السيطرة صفات النسيج الطبيعي حيث كانت الوحدات الافرازية مبطنة بخلايا ظهارية عمودية بسيطة ولا تتلون بملون شفت فوق الايودي وتكون حواجز الغدة سميكة وغنية بالاووعية الدموية.

### Introduction:

The cloacal gland (glandula proctodealis) is a sex accessory gland reported in Japanese quail (*contunix conurnix japonica*). The gland located in the dorsal region of proctodeum. Histologically, the gland consists of tubular secretory units, which open independently into the proctodeal cavity and surrounded by connective tissue capsule which send trabeculae between the secretory units (1). The glands produce thick foam that mixed with semen and inseminated into the female during copulation. The foam acts as medium for sperm transport along the oviduct and it is very important for fertilization (2). The cloacal gland development, size change, and foam production depend on the physiological status of the testis and testosterone concentration in blood plasma. The gonadotrophine hormones, food elements and day light period have an effect on the size of gland and its function (3, 4, and 5). Many of toxic chemicals affected the tissue of reproductive system, have drastic regression on

the size and function of the cloacal gland in male quail (6). The cloacal gland considered as an external indicator for testicular function in male Japanese quail (7). In crowded cities, cars and engine release fuel waste product chemicals which have health hazardous compound (8) 3-methyl-4-nitrophenyl (PNMC) in diesel exhaust have a toxic effect on the testicular tissue (9 and 10) and because of the extreme uses of diesel electrical generators in the crowded places in Baghdad city, this experiment design to investigate the gross and histological changes of the cloacal gland by the toxic effect of power generators exhausts.

### Materials and methods:

40 males of fifteen-week old Japanese quail (*Coturnix japonica*) were used in this study during March-May 2009. The birds were divided into four groups. The birds in first group housed in special polluted environment, were they directly exposed to the exhaust of electrical power generators of houses uses and working with diesel

for period of 60 days. The birds in second and third groups also housed in the same environmental conditions of birds in first group, but they were exposed to generator exhaust for period of 40 and 20 days respectively. While the birds of fourth group used as the control group where housed in optimal environment of good ventilation with fresh-air changed for each hour. At the end of exposing periods in each group, the observations about the cloacal gland size and the intensity of cloacal gland foam production were recorded in each group and the cloacal gland size measurements (length and width / cm) were made by using digital clipper, according to the formula proposed by (11), and then the birds in all groups were decapitated, for histological study all specimens of cloacal glands fixed in 10% formalin for (48) hr, routine histological processes was carried out, and the prepared sections stained by Hematoxylin & Eosin stain and Periodic acid Shift stain (12).

### Results:

#### • Gross observations of the cloacal gland.

Sever effects observed on the birds in the first group were their glands showed severely atrophied and their size was  $0.5 \pm 0.1 \text{ cm}^2$  and there is no foam produce by the gland when compare with control group, Fig. (1). The medium effects observed on the birds in second group which

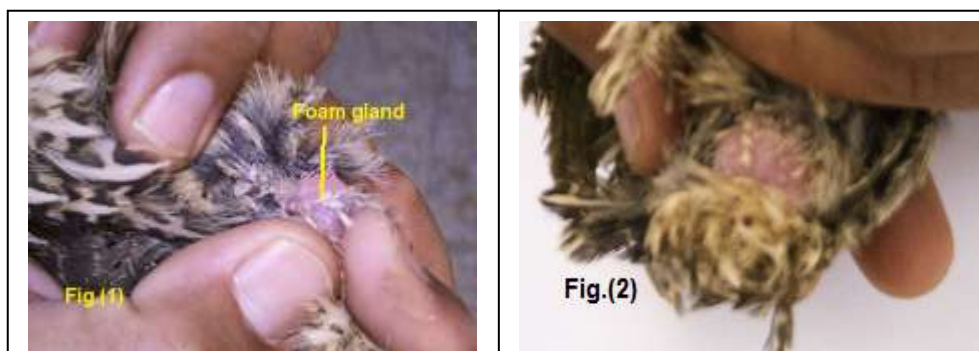
denoted intermediate atrophy of the glands and their size was  $1.2 \pm 0.2 \text{ cm}^2$  and showed no foam produced by the gland, Fig. (2). A mild glandular atrophy were observed in birds of third group which their glands size was  $1.7 \pm 0.3 \text{ cm}^2$  with produced a little amount of foam, Fig. (3). While the birds in fourth group (control group) showed normal glandular size of  $2.7 \pm 0.2 \text{ cm}^2$ , and their glands exaggerated with foam production, Fig. (4).

#### • Histological changes of the cloacal gland.

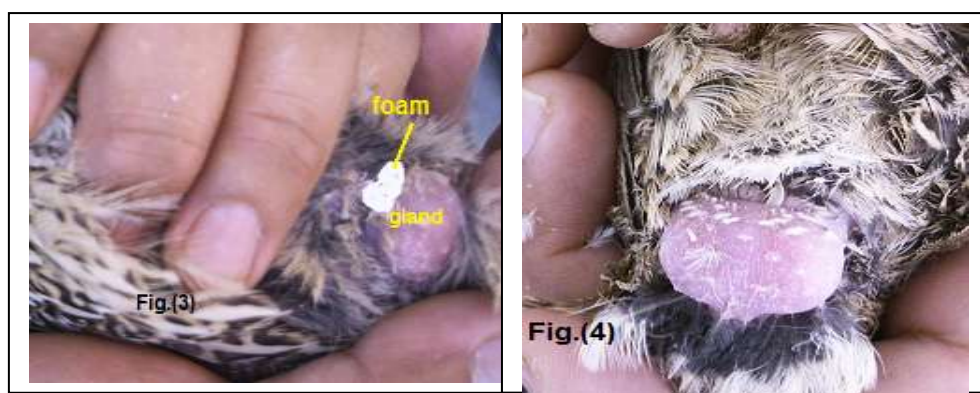
The histological changes which observed on the structure of the cloacal gland in birds of the first and second groups showed that, the parenchyma of gland was characterized by atrophied secretory units which lined by flattened epithelial cells of heights  $17 \pm 2 \mu\text{m}$ , and showed free of secretion within their lumen. The thickening of septa and interstitial connective tissue is well noticed, Fig.(5). while the histological sections of gland in birds of third group was characterized by slightly functioning secretory units lined with low simple cuboidal epithelium of height  $24 \pm 1 \mu\text{m}$ , the epithelium attach on slightly thick lamina propria and thin interstitial connective tissue, Fig.(6). The histological sections of control group showed normal histology of the secretory units which highly functioning and lined with simple columnar epithelium of height  $48 \mu\text{m} \pm 2$ , this epithelium has

oval to spherical large basally situated nucleus, and the apical part of this epithelial cells contains intracytoplasmic granules that give negative reaction with PAS stain.

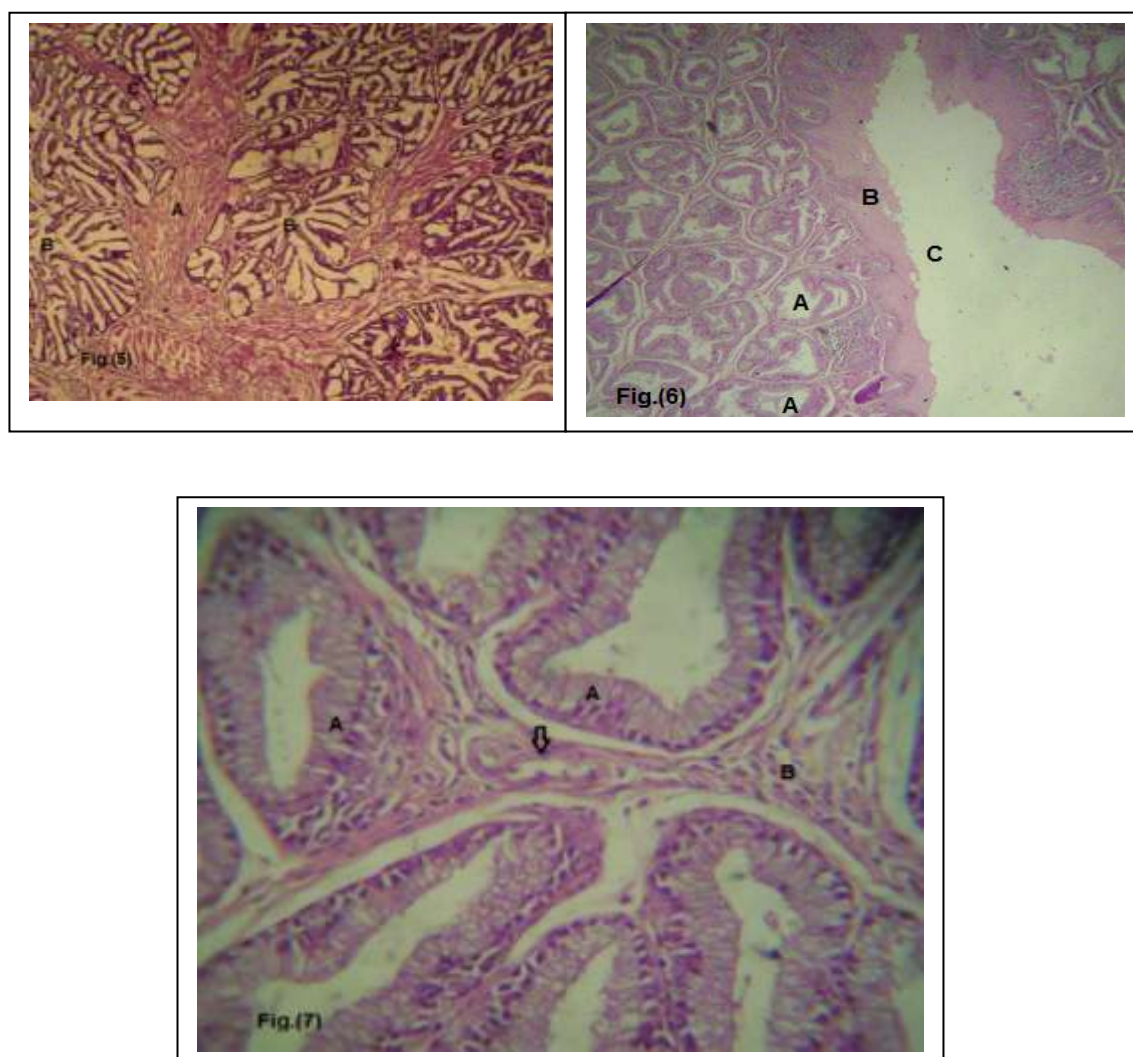
The lamina propria was thick and well of vascularized loose connective tissue. While the interstitial connective tissue appeared thin, Fig. (7).



**Fig. (1), (2): cloacal gland in birds of first and second groups respectively show decreased their size and there is no foam production.**



**Fig. (3): cloacal gland in birds of third group shows production of a little amount of foam. Fig. (4): cloacal gland in birds of fourth group (control group) shows normal glandular size that exaggerated with foam.**



**Histological sections of cloacal gland. Fig.(5) for bird in first and second groups showing: A. thick interstitial connective tissue. B. glandular units. C. septa. (H&E) stain 40 x. Fig. (6) For birds in third group showing: A. glandular units. B. Stratified squamous epithelium. C. proctodeal lumen. (PAS) stain 40 x. Fig. (7) For bird in control group showing: A. glandular units lined with simple columnar cells. B. interstitial connective tissue (arrow head shows arteriole) (PAS) stain 400x.**

### **Discussion:**

Many of applied studies had been done on the cloacal glands of Japanese quail, studies on the effects of several toxic and hazardous products to clarify the effects findings on the gland function and the relationships between these

toxicants and the function of this gland. All previous studies confirmed fact, that the cloacal gland function and size dependent on the testis function and the plasma levels testosterone concentration (13, 14 and 15). In this study the results

showed that sever to medium and mild affected of the foam gland by toxicants of generators exhaust which appeared on the size and function of cloacal gland. This result coincides with result of ChunMei who confirmed that the diesel exhausts contains 3-methyl-4-nitrophenol that effected on the interstitial cells of testis which release the male androgens (9). Also Biswas reported that the cloacal gland is markedly affected with the androgens that released by the testis and these androgens maintaining the function of foam gland (5). Halldin found that, the area of cloacal gland was decreased in their size and this related with decreased the concentration of plasma testosterone (14). Also Sachs refers to the production of foam that depends on the plasma testosterone concentration (13). The present study explaining that the longest periods of exposure to the generators exhausts gives variable degree of gross and histological pictures ranged from sever non functioning foam gland to medium and mild functioning foam gland and there are direct proportion between the foam gland size and foam production, this result agrees with the results of Biswas, ChunMei in male in male Japanese and rat (5, 9, and 10). The histological changes of non functioning glandular units in cloacal gland of birds exposed to the generators exhausts for the longest period explaining the relationship

between the atrophy of foam gland and the testicular function, this result supported by the result of (5 and 7). Also the result of EL-Gawish who used various doses of bisphenol A & DDT, which caused sloughing of seminiferous tubules and impaired testis function and atrophy of foam gland in Japanese quail(6). The present result accordance with results of Mohan found that the operation of hemi castration and castration induced significant effect in reducing the size of foam gland and its foam production (7).

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