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Comparative Histomorphological Study of Uterus Between Laying Hen and Duck

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Abstract: The present investigation was carried out on oviductal duck and laying hen to comparing of histomorphological structures of them. For this purpose, a total of forty adult healthy ducks and hens (each of them twenty), aged 1-1.5 years, were used. After dissecting them, some morphological parameters such as: total weight and length of oviduct were measured and then in each of specimen some morphological parameters such as; length, width and thickness of uterus were measured. For histological studies, after tissue preparation and staining with H and E, histological layers of uterus were recognized and the size of them with micrometry method were determined. By using t-test and analyzing factors between duck and hen we concluded that total weight and length of oviduct in hen was greater than duck and the difference was significant ($p < 0.05$). By comparing of dimensions and weight of uterus between duck and hen revealed that, in hen the mean of uteral weight (14.98 ± 2.58 g) and uteral width (5.00 ± 0.91 cm) were greater than duck. It was observed in duck (9.27 ± 2.04 g) and (3.19 ± 0.58 cm), respectively. In histometrical studies, the length of tunica mucosa, primary fold and muscularis mucosa width in duck were greater than hen. There was a significant difference in length of secondary fold and in hen (164.47 ± 34.16 μm) was greater than duck (119.80 ± 27.89 μm).

Key words: Histometry, uterus, duck, hen

INTRODUCTION

The avian oviduct has been studied extensively in some poultry birds, especially the domestic fowl (Pal, 1980; Balachandran *et al.*, 1985).

Chakravorti and Sadhu (1961) distinguished four histological zones in the oviduct of the pigeon and five zonations in the oviduct of the laying kite. Dominic (1960) studied the annual oviductal cycle of the domestic pigeon with special reference to the tubular glands of the magnum and the secretory phenomena of the funnel. Hutchison *et al.* (1968) observed a linear relationship between the ovary and the oviduct in respect of weight and histology of the magnum in the border canary. Histological development of the oviduct was maximum at the time of egg-laying. The information on oviductal function during the breeding cycle is still incomplete. Therefore, in the present investigation, histomorphological structures of uterus between laying duck and hen were compared.

MATERIALS AND METHODS

Forty adult laying ducks and hens (each of them twenty) aged 1-1.5 years, were used. They were collected once a month throughout the year from local natural populations. They were killed by cervical dislocation 24 h after capture. The whole oviduct was quickly

dissected out and stretched on a paper. The length (cm) of the oviduct was measured and weighed. In each of specimen some morphological parameters such as; length, width and thickness of uterus were measured by caliper device. For histological observations, uterus of the oviduct was separated by incision and fixed in 10% buffered formalin and processed for routine microtomy. After tissue preparation and staining with H and E, histological layers of uterus such as tunica mucosa, submucosa and muscularis were recognized and the size of them, primary and secondary folds length of tunica mucosa with micrometry method were measured and compared in two birds using t-test.

RESULTS

Weight, length and histology: In duck, weight of the uterus was low and its length was shorter than hen. There was significant difference in two birds ($p < 0.05$). Uteral weight in hen (14.98 ± 2.54 g) was more than duck (9.27 ± 2.04 g) but length and thickness of it had not significant different. In hen total weight and length of oviduct was larger than duck and the difference was significant ($p < 0.05$) (Table 1). In histological studies, in hen and duck, the serosa and muscle layers were thin, with short mucosal folds lined by a single layer of short columnar cells over the whole length of the oviduct. The epithelial height was also low throughout the oviduct.

Table 1: Comparing Mean±SD of morphological parameters in duck and hen

Parameters	Hen	Duck
Total weight of oviduct (g)*	56.19±9.64	35.68±9.910
Total length of oviduct (cm)*	71.85±5.47	60.27±10.19
Uteral weight (g)*	14.98±2.54	9.27±2.040
Uteral length (cm)	7.70±0.82	7.27±1.080
Uteral width (cm)*	5.00±0.91	3.19±0.580
Uteral thickness (mm)	2.07±0.61	2.09±0.720

*Significant with $p < 0.05$

Table 2: Comparing Mean±SD of histological parameters in duck and hen

Parameters	Hen	Duck
Primary fold length	1337.38±301.93	1497.27±108.78
Secondary fold length*	164.47±34.160	119.80±27.890
Tunica mucosa width	1368.05±515.62	1709.72±421.05
Muscularis mucosa width	122.22±20.840	159.02±50.050
Tunica submucosa width	99.58±51.540	62.22±29.070
Muscularis mucosa width	92.77±32.880	89.86±67.450

*Significant with $p < 0.05$

The serosa and muscle layers became thick, with enlarged mucosal folds, lined by columnar cells. In histological studies the mucosal height and primary folds of uterus in duck was more than hen but secondary folds in hen were larger than duck. Muscularis mucosa width in duck was more than hen but tunica submucosa and muscularis in hen were wider than duck. There was not significant difference between these parameters (Table 2).

DISCUSSION

In hen and duck the functional left oviduct consists of five regions: infundibulum, magnum, isthmus, uterus or shell gland and vagina. The wall of the oviduct consists of a mucosa made up from pseudostratified columnar epithelium and a glandular lamina propria. Longitudinal folds in the mucosa extend spirally down the length of the oviduct but vary in height and thickness. The muscularis is smooth muscle with inner circular and outer longitudinal layers increasing gradually in thickness. Loose connective tissue forms the serosa. The uterine mucosa forms flat, leaf-shaped, longitudinal folds. The epithelium is a continuous layer of columnar cells with alternating basal and apical nuclei and these have been named basal and apical cells. The basal cells have a restricted apical surface; the apical cells are ciliated. The tubular glands of the uterus are lined with cells that contain pale staining granules both before and during the phase of shell formation, but which are subsequently depleted.

In another researches magnum, isthmus and shell gland of 5 guineafowls and 5 fowls were compared histologically. In both species, the mucosal folds in each oviductal segment consisted of the mucosal epithelium

and lamina propria containing tubular glands. In the magnum of guineafowls but not fowls, the secondary mucosal folds were well developed forming many large duct-like structures in the lamina propria. There was no significant difference in the structures of mucosal tissues in the isthmus between the two species. In the shell gland, the distribution of tubular glands in the lamina propria at the bottom region of mucosal folds was denser than that at the apical region of the fold in guineafowls and fowls. The height of the mucosal folds was significantly greater in the shell gland than in the magnum and isthmus in guineafowls, whereas it was greatest in the magnum in fowls. The height of the mucosal fold in the shell gland was greater in guineafowls than in fowls. It is suggested that structural differences in the oviductal mucosal tissues are responsible for the formation of thicker egg shells in guineafowls compared with fowls (Yoshimura and Ogawa, 1998).

Structure and development of the uterus was studied in Japanese quail chicks. The uterus was wider and thinner than the cranial portions of the oviduct in the day-old birds. Histologically, the uterus was made up of low primary mucosal folds lined by simple columnar epithelium and subepithelial connective tissue. In the adult bird, mucosa formed numerous long, spatula-shaped folds covered by ciliated apical cells and basal cells. The lamina propria was loosely packed with tubular glands. Tunica muscularis was well developed and consisted of inner circular and irregular bundles and the outer thick longitudinal layer (Lucy and Harshan, 1998).

The structures of the post-hatchery developmental changes in the oviduct of high (Hy-line) and low (Dandrawi) egg-producing fowl were studied in the period from the first day to 24 weeks after hatching. The morphometrical studies of the oviduct in both breeds revealed that, the increase in the oviduct length for both breeds was slow until the 16th week of age. At the 20th week of age, the oviduct was markedly longer for Dandrawi than for Hy-Line. The average length was 17 and 10 cm, respectively. At 24 weeks of age, the oviduct length for Hy-Line was higher than for Dandrawi breed, average lengths were 75 and 70 cm, respectively. The diameter and the thickness of the oviduct, the height of lining epithelium as well as the height of the mucosal folds in the different segments of the oviduct were recorded (Kelany *et al.*, 1992).

Cells of the mucosal epithelium of the oviduct were studied by light and scanning electron microscopy in White Leghorn hens in lay and in moult. In laying hens, the epithelium was composed of ciliated and non-ciliated cells about equal in number in the magnum, uterus and

caudal infundibulum, while ciliated cells predominated in the isthmus and vagina and were exclusively present in the cranial infundibulum and utero-vaginal juncture. In the moulting hens, the epithelium was markedly deciliated throughout except in the vagina, in which it was only atrophied (Fujii, 1981).

Studies on histomorphometrical changes in different segments (infundibulum, magnum, isthmus, shell gland and vagina) of oviduct of mallard, *Anas platyrhynchos* during active and quiescent phases of the reproductive cycle have been made. The absolute and per cent length and width of each segment showed a marked change. The magnum showed an increase of 280%. Of all the histological parameters studied the number and height of mucosal folds and mucosal epithelium showed more marked increase in all segments of oviduct. The size of tubular glands and frequency of ciliated and secretory cells were studied in relation to oviductal activity (Sharma and Duda, 1989).

The surface patterns of the oviduct of *Gallus domesticus* were examined by Scanning Electron Microscopy (SEM) using several preparatory techniques. Ciliated epithelial cells predominate throughout the oviduct with non-ciliated cells approaching an equal proportion in the magnum and isthmus. Short, randomly oriented mucosal folds which characterize the infundibulum increase in height and longitudinal orientation as they approach the magnum. Here and in the isthmus they broaden and become dimpled with glandular apertures. The folds narrow again in the uterus and vagina. Cryofracture followed by SEM demonstrate the deeper mucosal folds and submucosal tubular system (Bakst and Howarth, 1975).

We concluded that, the oviduct of hen is more active of duck. In laying hen and duck such as other avian, the size and width of uterus were increased. The most of morphological parameters in hen was more than duck and the different was significant but histological parameter were nearly similar.

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