Review Article

BASRAH JOURNAL OF VETERINARY RESEARCH, 2023, 22(2):49-68.
https://bjvr.uobasrah.edu.iq/

Oviduct anatomy and histology: A comparative study in four adult female Iraqi birds (review article)

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DOI: 10.23975/bjvetr.2023.179943

Received: 2 June 2023 Accepted: 24 June 2023.

Abstract

The anatomy and histology of the oviduct among different birds' species is vitally ascribed to its functional role in eggs production, eggs quality, and fertilization. Therefore, understanding the morphological parameters of the adult female oviduct facilitates the accurate diagnosis of many diseases and prevents mortalities and production losses, the current article aims to review the morphological differences of the oviduct in four local domesticated birds: (Chickens) *Gallus gallus domesticus*, (Ducks) *Ansa ansa domesticus*, (Geese) *Anser anser* and (Turkey) *Meleagris gallopavo*. The results showed that the shape, length, width and weight of the oviduct varied among different bird species. Moreover, there were significant differences in the anatomical and histological measurements of the oviduct, such as the length of mucosal folds, the thickness of oviduct wall tunics and the distribution of glands. These differences were attributed to the relationship between the oviduct and egg weight, egg shape, fertility, and the size of pelvic bones. This review has effectively summarized the similarities and differences in oviduct morphological and histological parameters. providing valuable information on species reproductive traits and potential reproductive challenges.

Keywords: Anatomy, Birds, Eggs, Histology, Oviduct.

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Introduction

The poultry industry is the foundation of global food security, providing a dependable source of meat and eggs to support nutritional demands. These highly desirable products are valued by consumers for their high protein and metabolic energy content, recently the breeding of birds such as ducks, turkeys, geese and quails became the center of attention in many Iraqi villages, the products of the current domestic birds provide over 22% of the total demands and meet the various consumer preferences (1).

The avian oviduct is a crucial biological organ that undergoes continuous morphological, hormonal and biochemical changes during egg formation, any functional disorder can significantly affect the quality of eggs and shells, resulting in considerable financial losses in the egg production (2), The oviduct is a highly convoluted muscular tube, which is suspended from the left side of the abdominal cavity by the dorsal and ventral oviductal ligament (3). The oviduct in most avian species is composed of five segments: the infundibulum, magnum, isthmus, uterus, and the short tubular vagina, each of these segments is responsible for synthesizing specific components of eggs, including the peri-vitelline membrane, egg yolk, albumin, and eggshell (3,4). Additionally, the oviduct plays a critical role in transporting the ovum, depositing sperm, and providing a storage site for eggs and fertilization (4).

The understanding the anatomy and histology of the female genital system promotes the accurate diagnosis of many infectious diseases like E-coli , Newcastle and Trichomonas sp. in ducks and chickens and prevents high mortalities and production losses (5,6).

Despite the economic significance of local bird species in egg and meat production, the anatomical and histological structures of their oviducts have not been fully described. This review aims to address the knowledge gap by providing a thorough and informative description of the anatomical and histological structures of the oviduct in four domesticated Iraqi birds (Chickens) *Gallus gallus domesticus*, (Ducks) *Ansa ansa domesticus*, (Geese) *Anser anser* and (Turkey) *Meleagris gallopavo*. Highlighting the differences and similarities morphological features of the oviducts.

(Chickens) *Gallus gallus domesticus*

According to (Abdel-Rahman et al ,2015) the left functional oviduct of lying chickens is a highly vascularized, convoluted tube that occupies a significant part of the abdominal cavity located between the left ovary and cloaca (7). It is attached to the dorsal and lateral coelomic cavity by dorsal and ventral oviductal ligaments. The oviduct is divided into five main parts: infundibulum, magnum, isthmus, uterus, and vagina. The infundibulum is further divided into two parts, the funnel and neck regions. The funnel surrounds the left ovary with fringed structures called fimbria, followed by the neck, which is a short, tubular, thick-walled segment that facilitates the movement of eggs from the ovary to the oviduct. The magnum was described by (8),

as the longest and most convoluted part of the oviduct, presented between the infundibulum and the isthmus, characterized by a large lumen diameter with a thick longitudinally folded wall, the lumen gradually decreases in diameter, particularly close to the isthmus.

According to the observations made by (7), the isthmus is yellowish, narrower than the magnum, shorter, and less convoluted. The mucosal folds are thinner and project vertically. The uterus is a thick, distended muscular sac-like structure that holds the eggs during the formation of the eggshell. The cranial tubular part is called pars minor uteri, while the caudal expanded part is called pars major uteri. The uterus mucosal folds are leaf-like and interposed with circular directions as described by (7,9). The vagina is a tubular, curved structure that is shorter than other parts of the oviduct, opening in the cloaca caudally, it is composed of a muscular, thick wall according to (10) (Fig 1A).

The histological structure of the chicken oviduct has been described by (8), as a tubular organ composed of four arranged layers (tunics): t. mucosa, t. submucosa, t. muscularis, and t. serosa, arranged respectively. (Mishra *et al*,2014) found that the thickness of the wall comes from thick muscular components within the wall and the presence of numerous tubular glands, the mucosa of the infundibulum is composed of ciliated pseudostratified columnar epithelium and lamina propria, which comprises of fibrous connective tissue, and blood vessels with no noticeable glands (8). The mucosal folds are spiral, long, and subdivided into primary and secondary branches. Gradually, the folds become smaller near the magnum. The t. muscularis is composed of outer longitudinal and inner circular layers of smooth muscle fibers (3) (Fig. 2A). The magnum, according to (11), contained large tubular glands that opened at the epithelium, responsible for the production of albumin. The mucosal folds were short and numerous, and the lamina propria submucosa was well-vascularized. (Islam *et al*, 2002) mentioned that albumin glands appeared at 30 weeks of age in hybrid chickens and at 19 weeks old in Leghorn chickens (12). The isthmus was histologically similar to the magnum, but the number of glands was much higher than the magnum. These glands were responsible for shell membrane formation (Fig 6A). (Khan et al ,1999) reported that the isthmus gland developed at 19 weeks of age in Leghorn chicks and found that the mucosal folds were longitudinally arranged (13). The t. muscularis inner layer was thicker compared to other oviduct segments (Fig 2B, Fig 2C).

The mucosal folds of the uterus were characterized by their greater length and depth, and the lamina propria submucosa contained large tubular branched glands (Fig 6A). In addition, the t. muscularis of the uterus was thicker than that of other segments of the oviduct and highly vascularized, as described by (8). The vagina, on the other hand, was composed of tall, narrow primary mucosal folds subdivided into small secondary folds, and lacked glands in the lamina propria submucosa. The t. muscularis of the vagina was also thick and interposed with bundles of scattered connective tissue. The t. serosa in most portions of the oviduct was composed of loose connective tissue and small blood vessels, (11) (Fig 2D, Fig 2E).

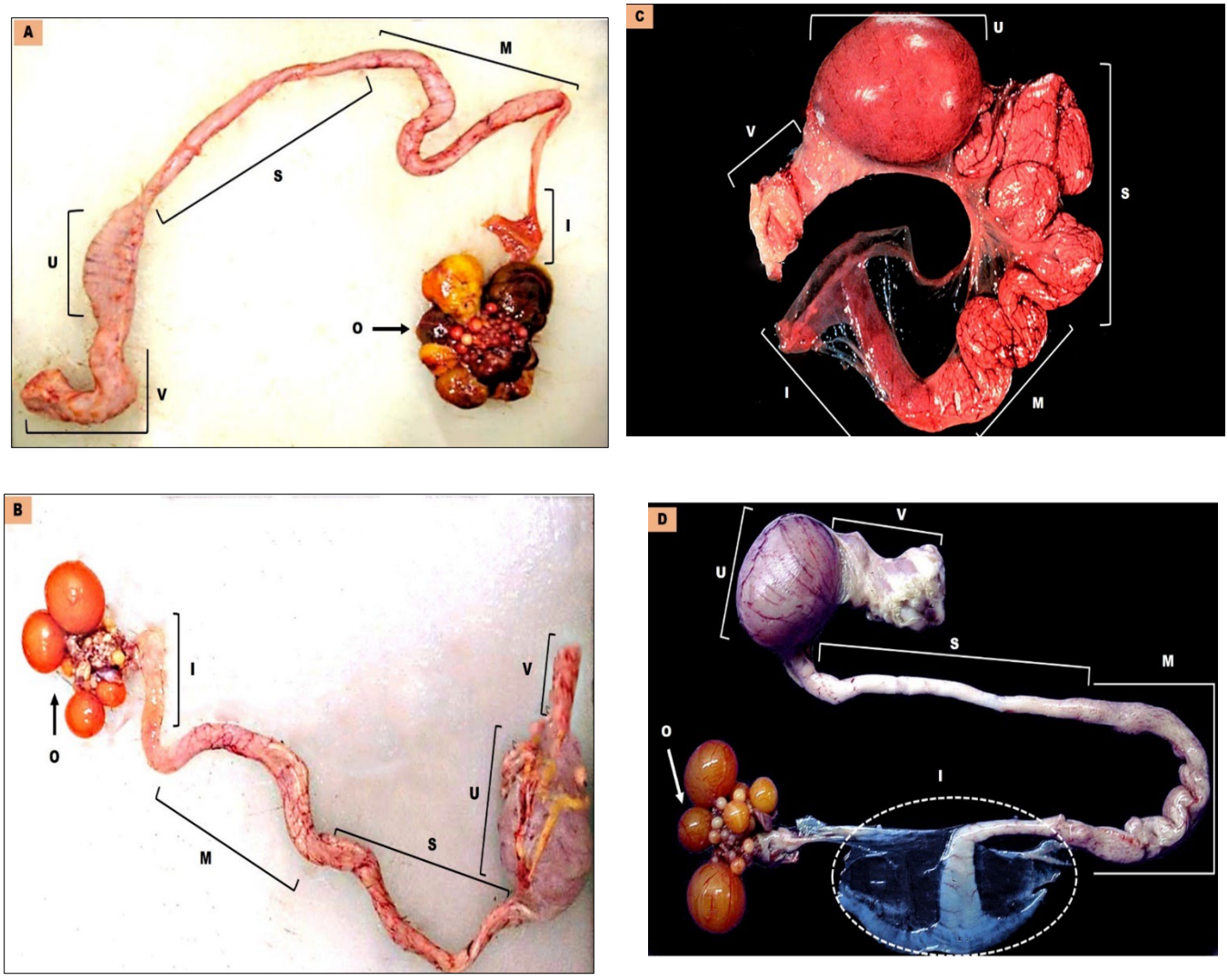

Fig 1: photographs illustrate the anatomical portions of the oviduct in chicken (A), duck (B), turkey (C), geese (D), composed of the ovary (O), infundibulum (I), Magnum (M), Isthmus (S), Uterus (U), and Vagina (V), (7,18,24)

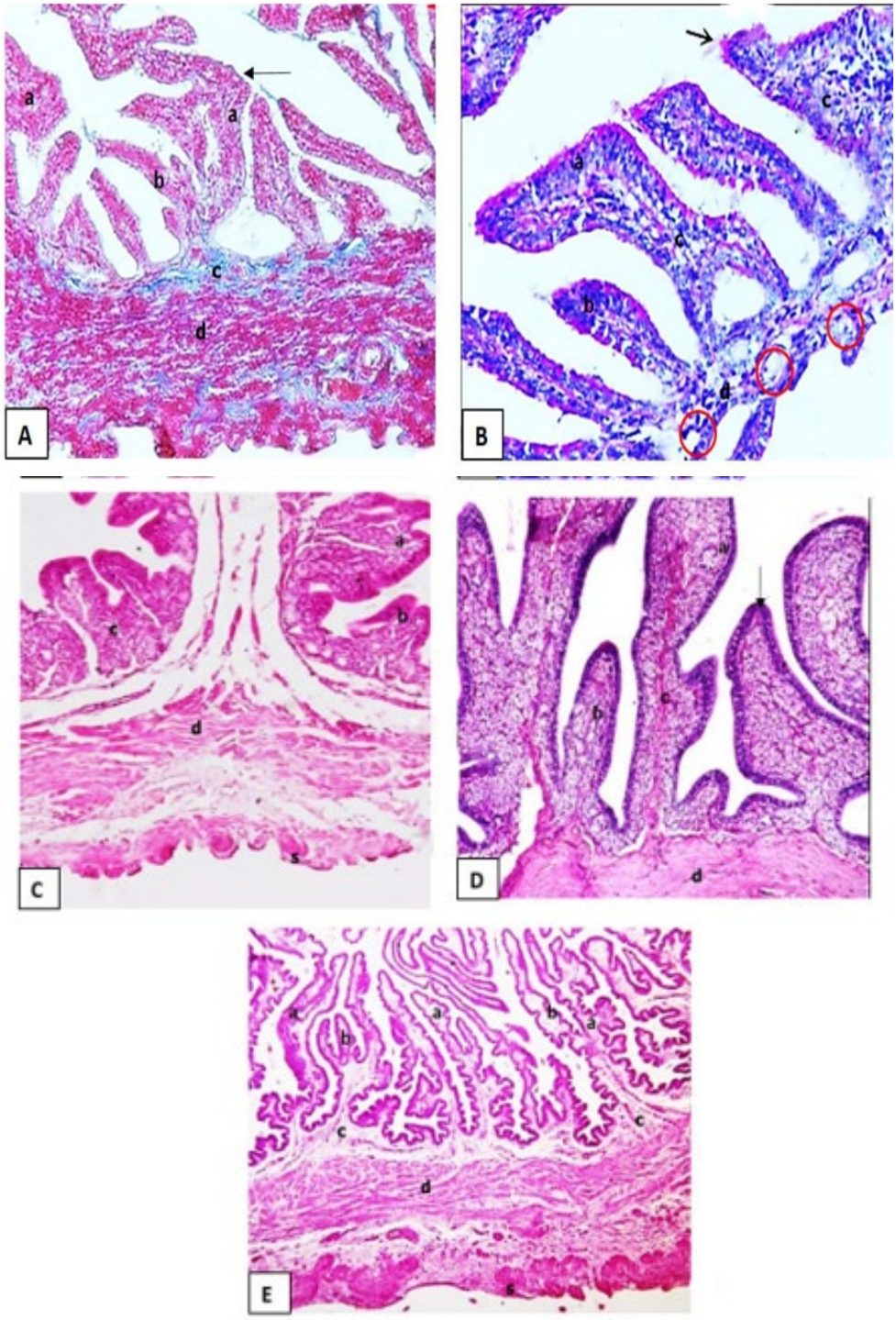

Fig2: Microphotograph shows the oviduct of chickens: (A) infundibulum, (B) magnum, (C) isthmus, (D) uterus, (E) vagina. (a) primary fold, (b) secondary fold, , lamina propria (c), tunica muscularis (d), tunica serosa (s) epithelium (ciliated pseudostratified columnar) (arrow), blood vessels (circles). (A, C: Mason's trichrome stain; B: PAS stain; D, E: H&E stain; A, B, C 10X, E 40X) (3,10)

(Ducks) ***Ansa ansa domesticus***

The left functional oviduct of lying ducks is a long coiled muscular tube, measuring (45-50 cm) in length, which occupies the dorsal and lateral space of the abdominal cavity among the left kidney, spleen, gizzard, and jejunum. It is suspended from the roof of the coelomic cavity by the dorsal and ventral oviductal ligaments (5). According to (7), the oviduct of ducks is divided into five portions, similar to that of chickens: the infundibulum, followed by the magnum, isthmus, uterus, and vagina. (Essam et al ,2016) also found that the infundibulum can be further subdivided into two parts: the funnel and the tubular neck part. The funnel is flattened and thin, with a transparent wall facing the ovary, while the neck is narrow, with a thicker wall, extending for (2-3 cm), connecting to the magnum (14).

According to (15), the magnum was the longest and most coiled portion of the oviduct. It was thicker and had a greater diameter than the infundibulum. The isthmus was the third portion of the oviduct, and as observed by (7), it was shorter than the magnum and straight with a narrow diameter. In ducks, the isthmus had a bright, thin, translucent zone called the zona translucence in the middle third of the isthmus.

The uterus, as described by (15), was a sac-like structure with a thick muscular wall and wide diameter. Its mucosal folds density was higher than that of other oviductal portions, with leaf-like lamellae extended out from the wall and intersecting with a transverse furrow. The vagina had two curvatures that opened directly into the cloacal urodeum, with a thinner wall than the uterus, and less mucosal folds arranged in circular patterns (3) (Fig 1B).

The histological observations revealed that the oviduct was composed of four layers: t. mucosa, t. submucosa, t. muscularis, and t. serosa. According to (14, 16), the mucosa of the infundibulum was lined with simple cuboidal to columnar ciliated epithelium, and the lamina propria-submucosa consisted of loose connective tissue, blood vessels, lymphocytes, and numerous tubular glands. The tunica muscularis was composed of two layers of inner circular and outer oblique smooth muscle fibers (Fig3A).

The mucosal folds of the magnum are irregular extending longitudinally and lined with simple columnar ciliated cells, and the submucosal glands are tubular branched type. The muscular layer consists of longitudinal inner and oblique outer smooth muscle fibers, as reported by (5, 17). According to (17), the mucosal folds of isthmus were shorter than the magnum and lined with pseudostratified columnar ciliated epithelium, and the lamina propria-submucosa contains branched, coiled type glands (Fig 6B). Additionally, the t. muscularis is thicker than the magnum and infundibulum (Fig 3B, Fig 3C).

The mucosal folds of the uterus were covered by pseudostratified columnar non-ciliated secretory cells, and the lamina propria-submucosa contained tubular branched glands and was intensely vascularized. The t. muscularis was the thickest among the preceding oviduct portions, composed of an inner circular layer and an outer longitudinal layer (3, 7) (Fig 3D). According to (5, 16), the vaginal mucosa was lined with pseudostratified columnar non-ciliated epithelium, and small pit-like structures called sperm-hosting glands were present within the lamina propria-submucosa, accompanied by small tubular glands. The tunica serosa of duck's oviduct constituted from loose connective tissue with mesothelial cells (Fig 3E).

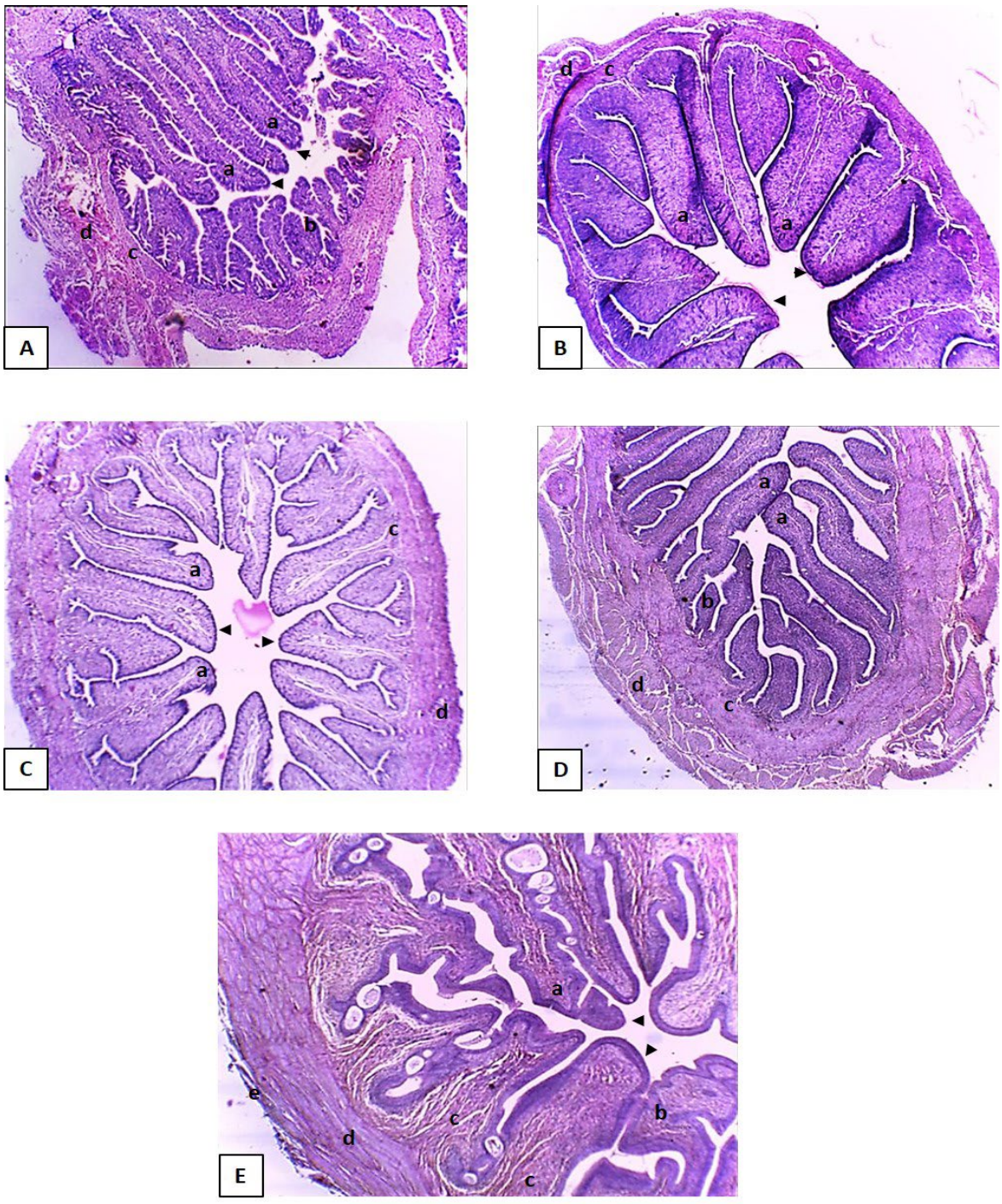

Fig3: Microphotograph shows the oviduct of ducks: (A) infundibulum (B) magnum ,(C) isthmus,(D) uterus ,(E) vagina : (a) primary fold (b) secondary fold (c) lamina propria (d) tunica muscularis mucosa (e) tunica serosa (arrows) epithelium (ciliated pseudo stratified columnar) (H&E stain 40 X) (14)

(Geese) *Anser anser*

The left oviduct of geese is distinctly different from that of chickens and ducks, as it is intensely coiled, measuring approximately (39-43 cm) in length, and fills the dorsal left side of the coelomic cavity. It is suspended from the roof with dorsal and ventral oviductal ligaments (18, 19).The infundibulum, the first portion of the oviduct, is divided into two parts. The first part is known as the funnel, which is characterized by a thin translucent wall and a fringed, fimbriated border facing the left ovary. The second part is tubular and has a thicker wall with spirally arranged mucosal folds (20). The anatomy of the magnum, the second portion of the oviduct, has been described as a long coiled tubular structure with a thicker wall and wider diameter compared to the infundibulum (21). The isthmus of the geese oviduct was short, less coiled, and had a narrower diameter than the magnum. The mucosal folds were also shorter, narrower, and longitudinally projected. The uterus was reported as the largest and widest portion of the oviduct (20), appearing as a distended sac-like structure with longitudinal-oriented mucosal folds intersected with circular lamellae (19). The vagina of lying geese was the shortest portion of the oviduct and consisted of one curvature that opened into the cloaca. It had a thick wall and longitudinally oriented mucosal folds (21) (Fig 1D). Histological observations of the oviduct by several authors (18-20) revealed that its wall was composed of several layers, including the t. mucosa, t. submucosa, t. muscularis, and t. serosa. The infundibulum funnel part, as described by (18,22), was composed of projections called fimbriae that extend along the anterior border. The mucosal folds in this region are longitudinally directed and were lined with ciliated pseudostratified columnar epithelium, and the lamina propria was constituted from loose connective tissue and housed many tubular glands. The mucosal folds of the tubular part were branched and lined with same epithelium (Fig 4A). The tunica muscularis consisted of two layers: the inner circular and the outer longitudinal muscle fibers. The histology of the magnum in geese was described by (20). According to the author's report, the mucosal folds of the magnum were subdivided into primary and secondary folds, and they were lined with pseudostratified columnar cells. Additionally, the magnum contained branched glands within its lamina propria, similar to those found in other parts of the oviduct (Fig 4B). The isthmus in geese was also examined in the study conducted by (20). As reported by the author, the mucosal folds of the isthmus were also subdivided into primary and secondary folds but were a bit shorter than magnum, the isthmus contained branched glands within its lamina propria. However, these glands in the isthmus were somewhat shorter in comparison to the magnum (Fig 4C, Fig 6C).The uterus wall was thicker than other portions of the oviduct, and the mucosal folds were longer, with a lining of ciliated pseudostratified columnar epithelium. The lamina propria was highly vascularized and contained numerous branched tubular glands. The tunica muscularis was relatively thicker in this portion of the oviduct

compared to other portions (18) (Fig 4D). The vagina in geese was short and had a narrow diameter accompanied by small groups of tall mucosal folds, the vaginal lamina propria lake of the glands and the inner circular muscular fiber became thicker to form the vaginal sphincter, while the tunica serosa was comprised of loose connective tissue in all oviduct portions (19) (Fig 4E).

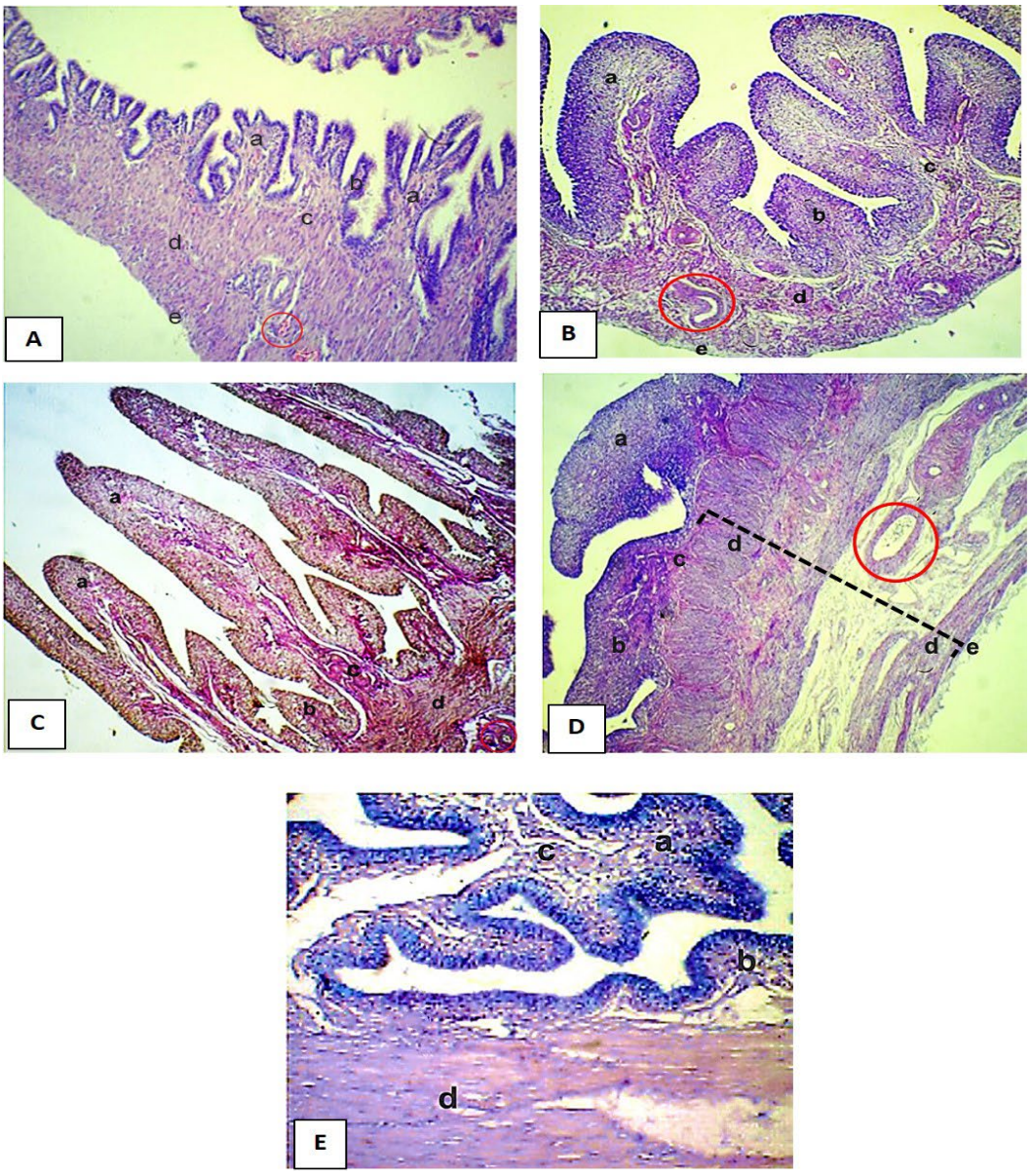

Fig4: Microphotograph show oviduct of geese: (A) infundibulum (B) magnum,(C) isthmus,(D) uterus ,(E) vagina : (a) primary fold (b) secondary fold (c) lamina propria (d-dashed lines) tunica muscularis mucosa (e) tunica serosa (circles) blood vessels (B-C-E 100 X) (A-D 40 X) H&E stain (19,20)

(Turkey) *Meleagris gallopavo*

The left oviduct was functionally developed while the right was atrophied according to (23). The oviduct of a turkey is comprised of five distinct portions: the infundibulum, magnum, isthmus, uterus, and vagina. The infundibulum is the first part of the oviduct, which subdivides into two further parts: the funnel part and the tubular neck. The funnel is flattened, translucent, thin-walled, and expanded anteriorly with a fimbriated border facing the left ovary. The tubular part is narrow and has a thicker wall (24).

The magnum in a turkey was reported by (25), as the longest and most convoluted portion of the oviduct, recognized by a wide diameter and thicker wall. Additionally. While the isthmus was shorter and less coiled than the magnum according to (24). The isthmus is also characterized by the presence of a narrow, constricted, translucent area. The uterus was described by (23), as the thickest and widest portion of the oviduct in turkeys. The mucosal folds were arranged longitudinally to form leaf-like lamellae intersecting with transverse corrugating grooves. The vagina was a spiraling and convoluted portion of the oviduct forming an S-shaped tube. The mucosal folds were spiral, intermingled transversely, and the vagina had one curvature opened caudally into the cloaca (24).

Histologically, the infundibular mucosal folds were spiral ridged lining with simple cuboidal epithelium in the upper part, ciliated simple columnar in the middle position, and ciliated pseudostratified columnar in the lower part. The lamina propria-submucosa was composed of loose connective tissue and was interrupted by dense blood vessels, but there were no tubular glands (Fig. 5A) (23). The magnum mucosal folds, as mentioned by (25), were irregular and longitudinally arranged. The length of the mucosal folds decreased caudally near the isthmus, subdivided into primary and secondary folds that were lined with ciliated pseudostratified columnar epithelium. The lamina propria-submucosa contained branched tubular glands that were diffused throughout the connective tissue, while the tunica muscularis was composed of an inner circular and outer longitudinal smooth muscle layer. The isthmus mucosal folds according to (24), were smaller and projected longitudinally, also divided into primary and secondary folds similar to those of the magnum. The tubular glands in the isthmus were shorter and fewer than those in the magnum, and the tunica muscularis was thicker in the circular layer and thinner in the outer layer (Fig 5B, Fig 5C).The histology of the uterus mucosal folds, as mentioned by (23), showed smaller and irregularly arranged mucosal folds that were lined with ciliated pseudostratified columnar cells. The lamina propria-submucosa was highly vascularized and separated by branched tubular glands (Fig 6D), while the tunica muscularis was the thickest compared to the other portions of the oviduct (Fig 5D).The vaginal mucosal folds were numerous and tall, lined with similar oviductal epithelium, the lamina propria lack of glands, and the vaginal muscles were thick, particularly at the posterior part to forming the vaginal sphincter (23, 25) (Fig 5E).

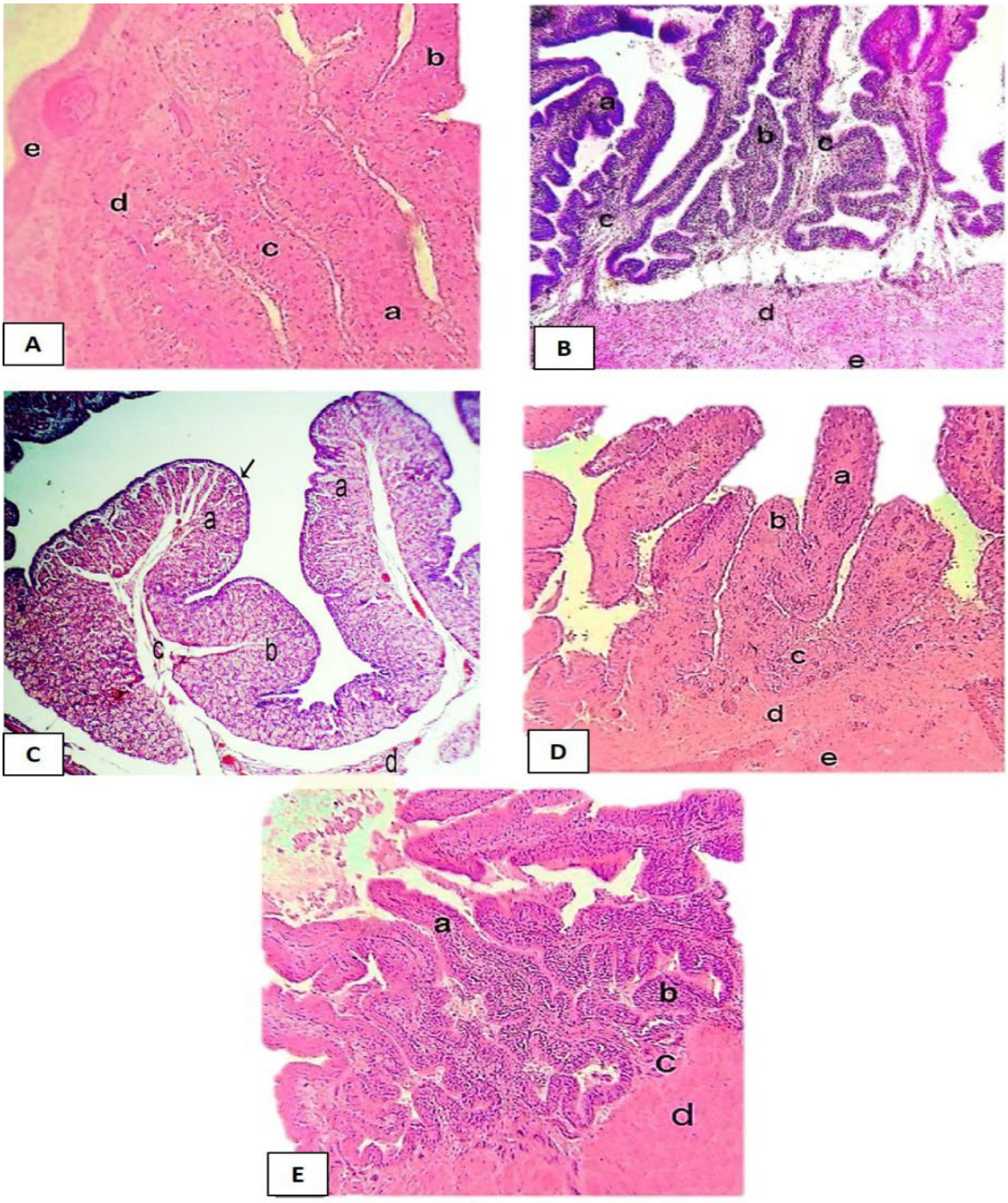

Fig5: Microphotograph shows oviduct of turkey: (A) infundibulum (B) magnum, (C) isthmus, (D) uterus, (E) vagina : (a) primary fold (b) secondary fold (c) lamina propria (d) tunica muscularis (e) tunica serosa (H&E stain 40 X) (23).

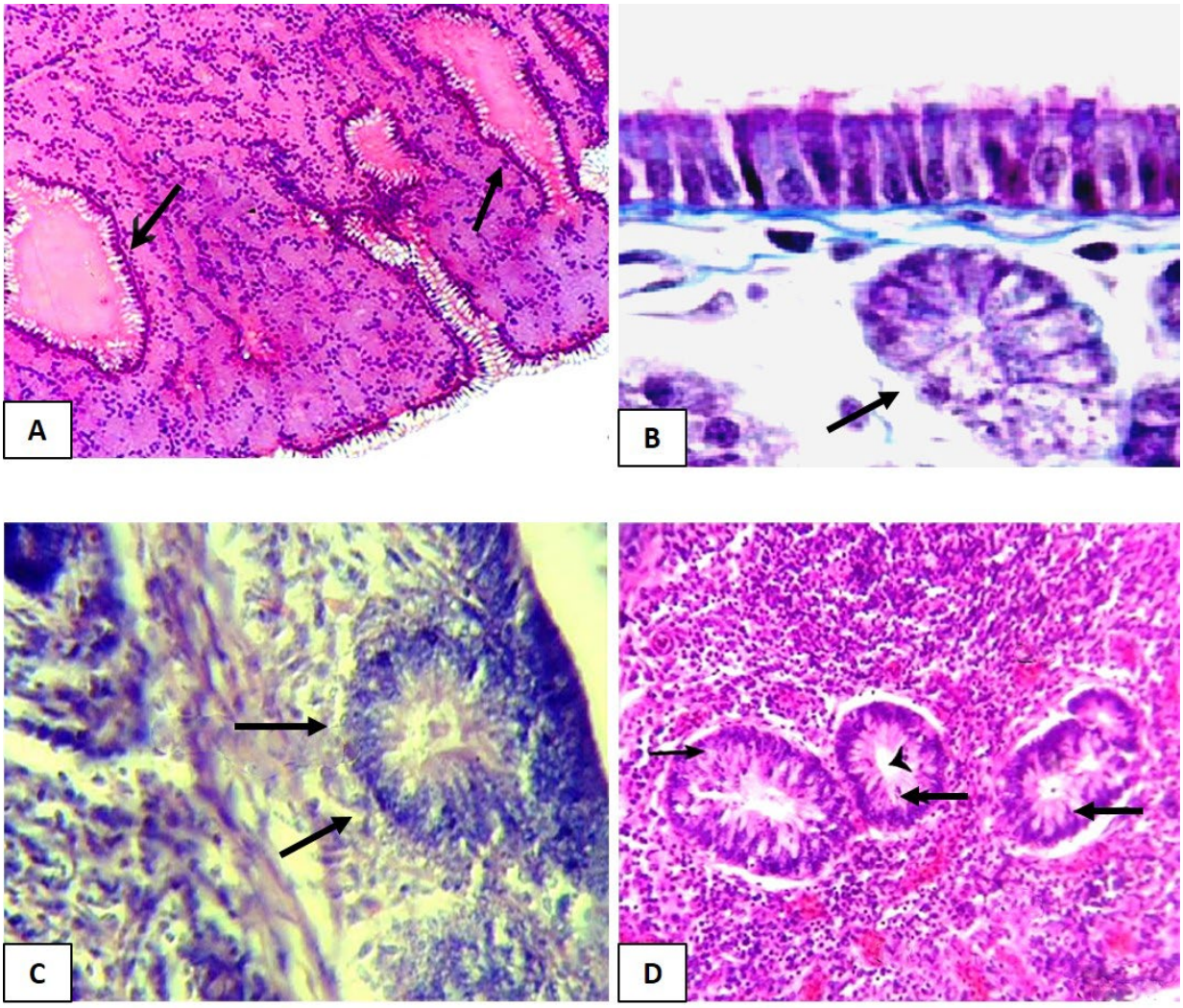

Fig6: Microphotograph shows glands of oviduct (A) chicken (B) duck, (C) geese, (D) turkey, (arrows) the tubular glands of oviduct (B: toluidine blue A:H&E stain 100X, B,C,D 400X) (10,16,18,23).

Species comparison argument:

The right ovary was found to be atrophied, and the right oviduct was absent in all types of birds. In contrast, the left oviduct was well-developed and composed of five distinct portions, namely the infundibulum, magnum, isthmus, uterus, and vagina. Among different bird species, the oviduct was found to be the longest and the heaviest in turkeys, followed by geese, chickens, and ducks (Table 1).

The first portion of the oviduct was the infundibulum, which was further divided into two parts, the funnel and the neck part, in all types of birds. The neck (tubular) part was found to be thicker in chickens compared to other types of birds, while the length was higher in geese and slightly shorter in chickens and ducks, and was very

short in turkey. The infundibular width was higher in chickens compared to ducks, geese, and turkey (Table 2, Table 3).

On the other hand, the infundibular mucosal folds were longitudinal in ducks and spiral ridged in chickens, geese, and turkeys, and the length of mucosal folds was higher in chickens and ducks but short in turkeys (Table 4). Additionally, the infundibular mucosal epithelium was different among birds, being ciliated pseudostratified columnar type in chickens and geese, and simple cuboidal or columnar in ducks and turkey. Furthermore, infundibular glands were also different, with no glands shown in chicken and turkey infundibulum while they were numerous in ducks and geese.

The magnum was the second portion of the oviduct, and it was the longest and most convoluted among bird types. The length of the magnum was highest in ducks and geese, followed by chicken and turkey, while the diameter was widest in chicken, turkey, and geese and narrowest in ducks (Table 2, Table 3).

The mucosal folds were short in turkey and geese and long in chicken and ducks, longitudinally oriented, while the width was highest in turkey compared to other bird types. The mucosal epithelium was ciliated pseudostratified columnar, except in ducks where it was lined with simple columnar cells. The density of tubular glands was different among birds; it was dense and large in chicken, ducks, and turkey while it was few in geese.

The tunica muscularis of magnum was composed of inner circular and outer longitudinal smooth muscle fibers in all bird types. It was thick in turkeys and ducks and thin in chickens, While the histological measurements in geese remain inadequately explored (Table 6).

The isthmus was shorter, straighter, and narrower for all birds. The presence of zona translucence (translucent-walled area) was confirmed in ducks and turkey, while the data were not clear about chicken and geese. The isthmus was longest in chickens, ducks, and geese and shortest in turkeys, while the width was indistinguishable among bird types (Table 2, Table 3).

The density of Isthmus tubular glands was high in chicken and turkey and few in ducks and geese, whereas the length of mucosal folds was high in chicken and ducks and short in turkey (Table 4). The tunica submucosa and tunica muscularis were very thick in turkey compared to other types of birds which were significantly thinner (Table 5, Table 6).

The uterus was sac-like in all studied birds, but the width was wider, particularly in chickens, and slightly tapered in turkeys, ducks, and geese. Also, the length varied among birds since it was long in turkeys and geese and a bit shorter in chickens and ducks (Table 2, Table 3).

The mucosal folds of the uterus were circular leaf-like structures interconnected with transverse furrows. The length was high in ducks and turkeys and shorter in chickens (table 4). Also, the tunica submucosa was the thickest in turkeys compared to other bird types. Additionally, the tunica muscularis was thick in this

portion of the oviduct, and the thickness differed among birds. It was very thick in the turkey uterus compared to ducks and chickens (Table 5).

The vagina was the shortest portion of the oviduct in all birds and the length of the vagina was relatively similar among birds (Table 2). composed of two curvatures in chickens and ducks and one in geese and turkeys. The mucosal folds were small and transversely directed. The length of mucosal folds was high in chicken and turkey and short in other birds. The tunica submucosa and muscular thickness were also higher in turkey than in other types of birds (Table 6, Table 7).

The morphological differences of the oviduct among birds are the result of years of evolution to provide the essential physiological needs for egg formation and transportation. Previous studies (27-29) have highlighted some points regarding the morphological and functional relationship between the oviduct and egg weight, egg shape, and the formation of egg cuticle shells.

Other authors (30) have found that pelvic size has a great impact on egg and oviduct shape and measurements, as small birds have a reduced abdominal space and a short, narrow oviduct.

Table 1: the gross morphometrical parameters of oviduct in chicken, duck, geese and turkey

Species	Total Length of oviduct (cm)	Total weight of oviduct (gm)
Chickens (7)	34.57	45.26
Ducks (7)	31.37	30.72
Geese (20)	54.80	68.30
Turkey (30)	72.80	82.40

Table 2: the length of oviduct portions in chicken, duck, geese and turkey.

Species	Length of infundibulum M±SEM (mm)	Length of magnum M ±SEM (mm)	Length of isthmus M ±SEM (mm)	Length of uterus M ±SEM (mm)	Length of vagina M ±SEM (mm)
Chicken (7)	41.43±0.23	145.60±3.22	74.44±1.85	48.44±0.41	2.34±0.18
Ducks (7)	41.92±0.87	190.92±2.11	66.61±1.41	45.10±0.53	29.10±1.02
Geese (18)	53.4±0.53	196.6±1.01	41.0±0.29	64.2±0.42	29.9±0.52
Turkey (30)	70 ±0.11	363.0±1.26	91.5± 0.17	94±1.06	110±0.08

M=mean, SEM=standard errors of mean

Table 3: the width of oviduct portions in chicken, duck, geese and turkey.

Species	Width of infundibulum M ±SEM (mm)	Width of magnum M ±SEM (mm)	Width of isthmus M±SEM (mm)	Width of uterus M ±SEM (mm)	Width of vagina M ±SEM (mm)
Chicken (7)	12.19±1.09	17.30±2.11	8.15±0.22	30.15±0.87	11.76±0.13
Ducks (7)	6.82±0.23	7.10±0.87	7.27±0.32	17.76±0.28	16.18±0.2
Geese (20)	4.42±0.19	13.4±0.79	9.21±0.45	18.4±0.20	17.62±0.08
Turkey (23)	3.0 ±0.07	16.1±0.25	8.20±0.09	19.7± 0.17	16.0±0.20

M=mean, SEM=standard errors of mean

Table 4: the mucosal folds length in different oviduct portions in chicken, duck, and turkey.

Species	Infundibulum M ±SEM (µm)	Magnum M ±SEM (µm)	Isthmus M ±SEM (µm)	Uterus M ±SEM (µm)	Vagina M ±SEM (µm)
Chicken (3, 31)	2012.5±371.85	4075.0±215.05	1146.23 ± 156.01	1337.38 ± 301.90	811.44 ± 223.22
Ducks (3)	1538.1±41.53	2256.3±10.47	1318.81 ± 244.90	1497.27 ± 108.78	658.33 ± 138.79
Turkey (32)	884.64± 71.938	1097.3±50.806	578.11±39.565	1453.5±57.090	775.80±75.674b

M=mean, SEM=standard errors of mean

Table 5: the thickness of tunica sub mucosa in different oviduct portions in chicken, duck, and turkey

Species	Infundibulum M ±SEM (µm)	Magnum M ±SEM (µm)	Isthmus M ±SEM (µm)	Uterus M ±SEM (µm)	Vagina M ±SEM (µm)
Chicken (3)	Null	Null	75.41 ± 30.33	99.58 ± 51.54	154.16 ± 29.76
Ducks (3)	Null	Null	74.16 ± 38.72	62.22 ± 29.07	185.83 ± 24.63
Turkey (31)	101.15± 9.251	209.24±28.155	160.34±8.989	130.11±12.229	161.68± 8.084

M=mean, SEM=standard errors of mean, Null =no data available

Table 6: the thickness of tunica muscularis in different oviduct portions in chicken, duck, and turkey

Species	Infundibulum M ±SEM (µm)	Magnum M ±SEM (µm)	Isthmus M ±SEM (µm)	Uterus M ±SEM (µm)	Vagina M ±SEM (µm)
Chicken (3, 31)	43.6±3.76	69.1±1.89	62.50 ± 21.81	92.77 ± 32.88	471.11 ± 204.96
Ducks (3)	85.81 ± 20.76	79.71 ± 13.62	81.11 ± 25.64	89.86 ± 67.45	323.88 ± 67.57
Turkey (32)	440.75± 14.251	367.58±25.610	451.91±31.625	1329.5±37.715	1633.6±45.990

M=mean, SEM=standard errors of mean

Conclusions

Egg production, quality, and the successful transportation and fertilization of ova are all dependent on a healthy and functional oviduct. Thus, understanding the anatomy and histology of the adult female oviduct can promote accurate diagnosis of infectious diseases and prevent mortalities and production losses. This review summarizes the similarities and differences in the morphological parameters of the oviduct among four domesticated bird species and clarifies the authors' work to provide significant assistance for veterinary specialists and biological researchers.

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دراسة تشريحية ونسيجية لقناة البيض في الأناث البالغة لأربعة طيور عراقية (مقال مراجعة)

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الخلاصة

تعد دراسة التركيب التشريحي والنسيجي لقناة البيض في انواع مختلفة من الطيور مهمة جدا وذلك لدورها في بناء ونقل وتخصيب البيوض بالإضافة الى ان معرفة التركيب الشكلي الطبيعي يساعد في تشخيص الكثير من الامراض التي تسبب هلاكات وخسائر اقتصادية كبيرة , وبناء على ذلك هدفت المراجعة الحالية الى تحليل الدراسات السابقة لتحري الفروقات الشكلية بين أربعة من الطيور المحلية الداجنة , أظهرت النتائج وجود اختلافات في طول وعرض ووزن قناة البيض في الطيور الأربعة الى جانب ذلك لوحظ وجود فروقات معنوية في قياسات اطوال الطيات المخاطية وفي سمك الغلالات وتوزيع الغدد والنسيج اللمفاوي ويرجع السبب وراء تلك الاختلافات الى العلاقة بين التركيب الشكلي لقناة البيض وشكل ووزن البيضة والكفاءة التناسلية وحجم الحوض .وبالتالي تمثل المقالة الحالية مساهمة علمية مهمة توضح اوجه التشابه والاختلاف في التركيب التشريحي والنسيجي لقناة البيض وتوفر المعلومات الأساسية المهمة للأطباء البيطريين والباحثين المهتمين لغرض تحسين صحة وانتاج الدواجن .

الكلمات المفتاحية: علم التشريح، الطيور، البيض ، علم الانسجة، قناة البيض.