AVIAN INTEGUMENT

It consists of the epithelium of the epidermis and the connective tissue of the dermis and subdermis.

The epidermis consists of a layer of living cells and a layer of cornified dead cells. The living layer comprises three layers: the basal, intermediate and transitional layers. The basal layer is adjacent to the dermis and constantly produces cells to replace those that are lost at the surface. This is followed by the intermediate layer consisting of enlarged polygonal cells which are characterized by desmosomes and are homologous to the mammalian prickle cell layer. This layer merges with the transitional layer in which keratinization is almost completed. Superficial to these living layers lies the cornified layer (stratum corcnuem) consisting of horny dead cells which contain mainly keratin and keratin-bound substances. In feathered areas the whole epidermis is only about ten cells thick, these being about equally divided between the living layers and the dead horny layer. In the foot pads the skin is greatly thickened to resist mechanical stress.

Compared with that of mammals the dermis is thin and its fibrous structure is relatively uniform rather than divided into dense and loose layers. Dermal papillae are absent except in the feet and under the feather follicles. Beneath the dermis there is sometimes a thin but distinct network of elastic fibres, the elastic lamina - which is a clear boundary between the dermis and the subdermis.

The subdermis consists of loose connective tissue. It contains fat, both as a layer and as discrete fat bodies which are attached by fascia to the underlying muscles and have been found in definite locations in the domestic fowl and in some passerine species.

HORNY STRUCTUES

* *Horny beak*
  The horny beak is a hard keratinized epidermal structure covering the rostral parts of the upper and lower jaws. Large numbers of sensory nerve endings are present in the beak.
* *Claws*
* *Spurs*
  They occur on the caudomedial surface of the tarsometatarsal region of the domestic fowl and turkey, being well developed in the male but only small in the female. A spur consist of a bony core covered by a pointed horny sheath
* *Scales*
  They are raised areas of highly keratinized epidermis separated by folds of less keratinized epidermis.

COMB AND WATTLES
They are characterized by a thickened and exceptionally vascular dermis with many arteriovenous anastomoses. In the turkey the dermis of the entire head and neck is relatively thicker and more vascular than elsewhere.

UROPYGIAL GLAND
The secretion of the gland is a lipoid sebaceous gland material, holocrine in type and consistinPPof a combination of sudanophilic secretory granules and fragments of the cells.

Cutaneous glands are absent except for the uropygial gland and those of the external ear and vent. Glands of the external ear secrete a waxy material containing masses of desquamated cells; other glands at and around the vent secrete mucus.

Since birds have no sweat glands, they regulate their body temperature by evaporative cooling from the respiratory tract and by heat transfer (radiation, conduction and convection) from the body surface, chiefly from the unfeathered parts of the body.

AVIAN FEMALE REPRODUCTIVE SYSTEM

Two bilaterally symmetrical gonads develop in the avian embryo. In birds generally, however, and in all the domestic birds the left ovary and oviduct soon exceed the right in their development. In the great majority of species in adult-life, only the female organs on the left side are functional, although rudiments of the right gonad and oviduct persist. At an early embryonic growth in the genetic female, the left ovary acquires, by direct migration, many of the germ cells of the right ovary.

An oogonium is essentially a germ cell which is actively multiplying. When the oogonia stop multiplying and begin to enlarge they become primary oocytes. The transition from oogonia to primary oocytes occurs at the time of hatching. Before hatching and for a while after hatching the left ovary consists of a cortex containing oocytes and an inner medulla. At the onset of sexual maturity the distinction between cortex and medulla is lost. However the cortex is now represented by ill-defined parenchymatous zones containing many immature follicles; the medulla is represented by other irregular vascular zones containing blood vessels, nerves and smooth muscle.

THE LEFT OVARY

The Follicle
A large follicle is suspended by a stalk which possesses smooth muscle and is abundantly vascularized and innervated. The follicle contains the large primary oocyte. This is enclosed by the wall of the follicle, which consists of the following six layers:
  * A *fine inner layer*- this comprises an inner zona radiata and an outer perivitelline membrane. The zona radiata consists of the fine radial processes of the cytolemma of the oocyte and the secretions and delicate radial processes of the granulose. It is a transient structure, disappearing shortly before ovulation. The perivitelline membrane is a layer of electron dense rods secreted by the cells of the stratum granulosum.
  * The *stratum granulosum* — a single layer of cells with an unusually prominent basal lamina
  * The *theca interna* — a compact cellular capsule
  * The *theca externa* — a loose wider fibrous layer
  * An *outer connective tissue coat*
  * The *superficial epithelium* — formed by peritoneal mesothelial cells (germinal epithelium).

The wall of the follicle is highly vascularized and quite profusely innervated.

THE LEFT OVIDUCT

THE GENERAL STRUCTURE OF THE WALL OF THE OVIDUCT
The wall of the oviduct possesses an epithelial lining, glands and smooth muscle. The epithelium consists of a mosaic of unicellular glands alternating with ciliated cells. This arrangement occurs in all parts of the oviduct.

The **unicellular glands** are biggest and most numerous in the magnum, where they discharge their contribution to the albumen as each egg goes by, and refill in the interval between successive eggs.

Multicellular tubular glands open on the mucosal folds of the tubular part of the infundibulum, the magnum, the isthmus (except in the translucent region), and the uterus.

The *mucosal folds* are more or less continuous throughout the oviduct, though varying in height and thickness. They are slightly spiral and thus rotate the egg as it goes down the oviduct.

The *smooth muscle layers*, inner circular and outer longitudinal, are thickest in the vagina and uterus and thinnest in the Infundibulum. One function is rapidly to transport spermatozoa by oviductal peristalsis. Another is to drive egg down the oviduct by peristaltic waves.

PARTS OF THE LEFT OVIDUCT

Infundibulum

It is made of two parts: a funnel followed by the tubular part. The funnel has a thin wall and low mucosal folds. The tubular part (chalaziferous layer) has a slightly thick wall and taller mucosal folds with more secondary folds than in the funnel.

Plates of glandular cells occur at the bottom of the grooves in the wall of the funnel region. The tubular part has some convoluted branched tubular glands, but these are confined to the region adjacent to the magnum. The cells of these glands differ from those of the magnum, their secretory granules being smaller and not compressing the nuclei so strongly into a flattened form and basal position.

Magnum

The transition into the magnum is abrupt being marked by a sudden great enlargement of the mucosal folds. The great thickness of the wall is caused by the presence of numerous tubular glands which are packed into the massive mucosal folds. These folds are taller and thicker than those of any other region, increasing the secretory area of the mucosa by a factor of about three. There about 23 primary folds which are devoid of true secondary folds, the few indentations in the epithelium are due to ducts of the glands.

The branched convoluted tubular glands in the lamina propria reach their greatest development in the magnum. Their cells contain large eosinophilic granules and have small flattened basal nuclei. The ducts open anywhere on the luminal surface, but are difficult to see in ordinary histological sections except after their secretion has been released. Immediately before ovulation the cells of these glands are so packed with their secretion (which forms the bulk of the egg-white protein) that the lumen of the glands and the interglandular connective tissue are almost invisible. After the discharge of the secretion the lumen and the outlines of the individual glands are more easily distinguished. The stimulus to discharge may be mechanical arising from the passage of the egg along the magnum. However, some glands seem to remain full even though many others are emptied, and this may indicate that discharge is controlled by more complex factors than simple mechanical influences.

The last few centimeters of the magnum are modified to form the mucous region of magnum. The folds and tubular glands here are much reduced, and the glandular cells contain relatively abundant mucus.

Isthmus
A narrow and sharply distinguished translucent band of tissue (1-3mm wide in the domestic fowl) marks the exact junction of magnum and isthmus. The folds of the isthmus are less prominent than those of the magnum, but unlike those of the magnum they carry secondary folds. The translucent region is unusual in having no tubular glands. The rest of the isthmus has tubular glands resembling histologically those of the magnum. However, only the cells of the isthmus glands possess sulphur-containing proteins, which is consistent with the production by the isthmus of shell membranes of a keratinous nature.

Uterus
Its longitudinal mucosal folds are intersected by transverse furrow, thus forming numerous leaf-like lamellae (about 4mm tall). When an egg is inside the uterus these lamellae flatten themselves against the shell. The tubular glands differ from those of the magnum, their cells being less granular and more vacuolated and possessing larger basally or centrally placed nuclei.

Vagina
The junction of the uterus with the vagina is marked by a sphincter which serves as the beginning of the vagina. The vagina is fixed by smooth muscle and connective tissue in a permanent S- shape. The muscular layer of the vagina is generally thicker than the remaining part of the oviduct. The mucosal folds are relatively thin and low an possess secondary folds. In the region of the sphincter the folds carry the tubular vaginal fossulae which are the main site for storage of spermatozoa.