



**HISTOLOGY Exam for 2<sup>nd</sup> year**

٢٥ January 2017

First semester

Time allowed: -3 hours

(Total 50 marks)

Support your answer with drawing as possible

**I- First Group**

(Total 17 marks)

**A-Explain the histological structure of the following:**

**1- Bronchioles.**

(4 marks)

**Mucosa** → Simple columnar or cuboidal ciliated or not with Clara cells  
 (Bronchiolar exocrine cells)

The m.m thrown into longitudinal folds which decrease in  
 highest toward 2<sup>nd</sup> bronchiole.

**L. propria** very thin mainly consists of elastic fibers.

Ms → well developed layer of circularly disposed SMF.

Cartilage and glands → not present

**T. adventitia** → thin layer of C.T that invests Ms & blend with the elastic  
 of the inter alveolar septa.

NB → simple columnar of primary, secondary bronchiole are **Clara cell** +  
**Secretory cell**

**Clara cell:** - columnar cells that devoid of cilia and some secretory granules in the cell apex that give  
 glycosaminoglycans which protect the lining epithelium. Numerous mitochondria, sER). Glycogen granules abundant  
 in ruminant and carnivores.

**Terminal bronchiole**

The bronchioles give rise to many terminal bronchioles.

**L. epith** → simple cuboidal ciliated or not.

It rest on long thin elastic fiber.

Surrounded with SMF.

The terminal bronchiole surrounded with elastic fiber.

**(B) Respiratory Portion:-**

It begins with respiratory bronchioles which resemble in structure the “Terminal bronchiole” except its wall is  
 interrupted with alveolus.

The respiratory bronchiole divided into 2:11 alveolar duct.

They are numerous and branched in carnivores

Occasionally present in horse

They are short and absent in pigs and ruminants.

**2- Spinal cord of dog.**

(3 marks)

It present caudal to medulla oblongata.

Is important in the integration of visceral, somatic sensory & motor activities that are critical to the survival of animals.

The spinal cord is cylindrical in shape.

**Motor nerve**, leave spinal cord through ventral root of spinal nerve along (ventrolateral sulcus)

The Sp. Cord divided into 4 components by the bilateral exist & entrance of nerve fibers.

H. Shape → gray mater.

Nerve fiber → white mater “out side gray mater”.

**Gray mater** →

1) Nerve fiber “myelinated, unmyelinated.

2) Oligodendroglia.

3) Neuroglia.

4) Protoplasmic Astrocyte.

5) Neuron scattered along gray mater but mainly distinct in ventral horn.

6) Fine C.T fiber & blood vessels.

7) Central canal lined with “epindymal cell”

### **White Mater:-**

Myelinated, unmyelinated nerve fiber.  
Scattered fibrous Astrocyte & blood vessels.

### **3- Olfactory region of horse.**

**(3 marks)**

It consists 3 types of cells:-

#### **Supporting (sustenticular cells)**

Tall columnar & their free surface carry microvilli.  
It contains pigmented granules “give color of olfactory yellow color.”  
Oval light stain nuclei with the proximal portion.  
Basal portion always bifurcated.

#### **E.M**

Extensive Golgi in the portion “SER, lysosome.  
Pigmented inclusion “vesicle appear secretory in nature”  
Nuclei contain euchromatin than olfactory cell  
Microvilli in the apical portion basal border extend toward the basement membrane.  
Desmosomes & hemidesmosome between adjacent cell in addition to junction complex that connect cell to dendritic bulb

#### **2- Olfactory cell “bipolar cell, Receptor cell**

It distributed between supporting cells.

It's bipolar nerve cell.

Apical border is modified dendrites extend as cylindrical process.

- The basal border of the cell tapers into thin process 1 um which is an axon (one of the fiber of the olfactory nerve).
- The dendrites expand on the surface to form the olfactory vesicles from which delicate olfactory hair extend (6:8 olfactory cilia).

The axon deeply penetrates the L-propria (unmyelinated nerve fiber).

These specialized cilia appear to be the component of the sense organ which is exited with the ouder substance.

#### **3-Basal cell (stem cell) :-**

Form single layer of small conical elements with dark nuclei.

Branching process which interlacing with each other & the bifurcated end of the supporting cell.

It may consider the store cell for the other cells.

#### **Lamina propria:-**

It is continuous with the dense C.T forming the periosteum of the cribriform plate. Numerous pigment cells, lymphoid, blood plexus.

It contain Bowman's gland” tubuloalvoelar gland.

The secretion of Bowman's glands keeps the nose moist.

Make freshness of the bipolar cilia.

Solvent for the ouderous gases which affect the cilia

### **b- Compare between the following:**

#### **1- Pnumocytes type I and pnumocytes type II.**

**(4 marks)**

Pneumocyte type I:-

Are extremely attenuated cell “flat cell” flat nucleus.

It lines the alveolar surface.

Cytoplasm contains abundant pinocytotic vesicles which play significant role in the turn over of the surfactant secretion & the removal of the contaminant from the outer surface.

It represents 40% of the total cell.

Cover 97% of the total surface area

It not divided.

Cytoplasm contains microfilament and microtubules.

Function → specialized for gas exchange.

Pneumocyte type II (great alveolar cell or septal cell or granular):-

It represents 60% of the total number.

It covers 3% of the surface area.

Cytoplasm contain Golgi, lysosome, rER, sER, mitochondria etc..

Large round cell, with round nucleus.

Free surface contain microvilli.

It can also divide into pneumocyte I, II.

They elaborate membrane bounded lamellar bodies which is the source of phospholipids in pulmonary surfactant.

**Formation of the surfactant:-** phospholipids of multilamellar bodies fuses with protein of multivesicular bodies forming lipoprotein vesicle which secretes it's content on the surface → surfactant which aid in reduction surface tension of alveolar septum cell that mean the least inspiratory force need to inflate the alveoli thus reduce work of breathing. Surfactant has bactericidal effect. Surfactant not static and remove by pinocytotic vesicle & secreted again.

## 2- Autonomic ganglia and cerebrospinal ganglia.

(3 marks)

Sympathetic ( Autonomic) Ganglion	Cerebro-spinal Ganglion
<p>THE NERVE CELLS ARE :</p> <ol style="list-style-type: none"> <li>1.—Small, and numerous.</li> <li>2.—Multipolar.</li> <li>3.—Scattered all over the ganglion.</li> <li>4.—Surrounded by a less apparent layer of satellites</li> <li>5.—Devoid of a glomerulus.</li> </ol> <p>THE NERVE FIBERS IN BETWEEN THE CELLS ARE :</p> <p>Thin and non-myelinated and are scattered</p>	<p>-Large and few in number.</p> <p>-Unipolar or Pseudo-unipolar</p> <p>-Arranged in groups or rows.</p> <p>-Surrounded by an apparent single layer of "satellites" or "capsule cells".</p> <p>-Provided with a "glomerulus" (which is a convolution of its axon in the immediate vicinity of the cell).</p> <p>-Thick and myelinated and are gathered in groups</p>

## II-Second Group

(Total 17 marks)

### A-Discuss the histological features of the followings:

#### 1- Epidermis.

(4 marks)

The epidermis consists of 5 layers. Only in (sole & palm) have 5 layer but in case of thinner epidermis not have 5 layer. It consists of st. sq. epith.

**Stratum basale "germinativum"**

**Stratum granulosum.**

**Stratum spinosum "prickle layer"**

**Stratum corneum**

**Stratum lucidum " clear layer".**

**Stratum basale" stratum germinativum.**

Basophilic columnar or cuboidal cells rest on basement membrane.

Desmosomes bind it laterally & upper surface.

Hemidesmosome bind it to the basement membrane.

It shows intense mitotic division.

It responsible for the constant renewal of the epidermal cells with the initial portion of the next layer.

E.M → tonofilaments, melanosome, secretory granules. RER,

Mitochondria, GA

\* **Stratum spinosum "prickle layer"**

- Polygonal cells with central nucleus.

- It have cytoplasmic process "spine".

- This layer is firmly bounded together with desmosomes & tonofibrils.

- When it subjected to continuous friction that leads to thickness of tonofibrils

\*Both stratum basalis & stratum spinosum called **malpighan layer**:

\* **Stratum granulosum:-**

Flatten polygonal cells with central nuclei.

Cytoplasm filled granules called **keratohyalin granules**.

They are non membrane bounded granules it contain *Histidine rich protein granules*.  
These cells also contain membrane coating granules called "*Lamellar granules*" = *odland bodies*. It produced by Golgi complex.

These granules also present in stratum spinosum.

These granules are ovoid or rods like.

It released into the inter cellular space.

It contains mucopolysaccharides & phospholipids.

It act as cement material "act as barrier against foreign bodies"

\* *Stratum lucidum* "*clear layer*"

It's translucent layer, homogenous.

Flatten cell & eosinophilic cytoplasm. Both of the nucleolus & cytoplasmic organelles not evident.

Several layer of fully keratinized, closely compacted and dead cells.

Cytoplasm contains dense *cytokeratin* embedded in amorphous dense matrix derived from keratohyalin granules.

The intermediate filaments & the matrix constitute the immature keratin which sometimes called *eleidin*.

***Stratum corneum:-***

These are flatten non nucleated cells

It contains numerous keratin granules.

Several layer of completely keratinized, dead scale like keratinocyte with thickened plasma membrane.

These cells represent final stage of keratin.& are filled with mature keratin

Intercellular lipid substance derived from the lamellar granules is present between stratum corneum cells → it form complex barrier.

Dead cells are continuously sloughed from the surface.

Soft keratin → must pass through tonofilaments → keratohyalin,

Eledine → Keratin.

Hard keratin → tonofilaments → keratin

## **2- Mammary gland in different stages.**

**(4 marks)**

In Young age before puberty (Calves)

The gland consists of lobules of adipose tissue separated from each other by CT septa

Non functional ducts lined with stratified epithelium present between the lobules of the adipose tissue

Solid masses of cells present at the bases of these ducts which later on represent the future secretory units ( Alveoli)

In Young age at puberty (Virgin, Heifer)

The amount of the adipose tissue decrease in comparable to the young age

The non functional ducts still present while some of these ducts shows growth and differentiation

The primordial of the intralobular duct appears and lined with simple cuboidal epithelium

Some of the solid masses cells become differentiated and give the primordial of the alveoli which still inactive and lined with simple cuboidal epithelium

In pregnant female for the first time (Pregnant heifer)

The non functional duct nearly disappeared and replaced by newly formed alveoli

Most of the adipose tissue disappear and replaced by the secretory units

The excretory duct represented by interlobular duct which lined with stratified squamous epithelium

Some of the alveoli become active and filled with colostrum milk which is richly supplied with immunoglobulins and lymphocytes, plasma cells and macrophages.

In lactating female

The amount of the C.T. in the gland decrease to become fine reticular and collagen fibers

The alveoli become highly active and filled with milk secretion

Most of the alveoli are active in the different stages of milk production ( Synthesis, release and storage stage) so the epithelium lining of the alveoli vary according to the stage of production

In the stage of synthesis ( simple columnar to high cuboidal ), in the stage of release ( simple cuboidal ) and in the stage of storage ( simple squamous epithelium)

The intralobular duct may also act as secretory unit and give milk secretion

The myoepithelial cells located between the alveoli and its basement membrane and it characterized by large irregular boundary cell with large nuclei and eosinophilic cytoplasm. It responsible for the contraction of the alveoli to empty its contents to the duct or sinus.

In the dry period

the dry period is the period prior to the next delivery and it start from the last 2-3 month of pregnancy in large animals



### *Sweat gland*

Simple tubular gland with coiled secretory portion and straight excretory duct  
it may be merocrine or apocrine gland

#### *Apocrine sweat gland*

It gives odorless secretion then become distinctive odor due to bacterial decomposition

*Secretory unit* → it has large lumen

Lined with one layer of flattened cuboidal or low columnar epithelium.

The cell filled with glycogen, lipid, pigment granules.

Apical surface provided with cytoplasmic protrusion between the secretory cells & basement membrane. Cells between secretory cells & basement membrane is myoepithelial cells

*Duct* →

It penetrates epidermis of hair follicle before it open on the skin surface. It lined with stratified cuboidal cell

It has narrow lumen

*Site* → Human → (Axillary, pubic, perineal region)

Horse → active gland, goat, cat → less active

Ruminant → wide lumen gives appearance of sebaceous gland.

#### *Merocrine sweat gland*

*Site* → Foot pad of dog, cat

Nasolabial region of ruminant. Carpus in pig

*Duct* → open directly into the epidermis lined with st. cuboidal epith.

*Secretory cell* → Lined with cuboidal epith.

Dark cell →  
Clear cell →

\* *Dark cell* → (mucoid cell)

Its basal surface not touch basement membrane

Contain large number of ribosome + secretory granules which contain glycoprotein abundant is apical borders  
(Mitochondria, R.E.R and Golgi)

\* *Clear cell*

Wide base with tapering end. Plasmalemma has characteristic invagination involved in the trans epith- salt & fluid transport

### **III-third Group**

**(Total 16 marks)**

#### **A. What are the characteristic points of the following?**

##### **1. Duodenum and cecum.**

**(3 marks)**

In addition to gastrin- and somatostatin-producing cells, we also find endocrine cells secreting cholecystokinin and secretin. Cholecystokinin stimulates the secretion of digestive enzymes in the pancreas and the contraction of the gall bladder. Secretin stimulates the pancreas to release "pancreatic juice", which is rich in bicarbonate ions. Secretin also amplifies the effects of cholecystokinin.

**The lamina propria** is, similar to the lamina propria of the stomach, unusually cell rich. Lymphocytes often invade the epithelium or form solitary lymphoid nodules in the lamina propria.

Lymph nodules may form longitudinal aggregations of 30-50 nodules in the lamina propria of the ileum. These large aggregations are called **Peyer's patches**.

**The muscularis mucosae** have two layers and extend into the intestinal villi, where the smooth muscle cells form a longitudinal bundle in the centre of the villi. , which is thin and incomplete in dog

#### **The Submucosa**

The submucosa contains glands only in the duodenum. Submucosal glands of the duodenum are also called Brunner's glands. Their secretion is mucous and slightly alkaline due to bicarbonate ions (pH 7-8). The amount of bicarbonate is however too low to neutralize the acidic contents of the duodenal lumen. Instead, the secretion of Brunner's glands protects the duodenal mucosa - similar to the mucus which protects the gastric mucosa. This gland is serous (dog & ruminant), mucous (pig & horse) and Seromuroid (cat).

**Muscularis externa**, consists of inner circular and outer longitudinal SMF

**Serosa**, loose C. T blends with the mesothelium of the peritoneum.

- varies in size within species.

- Substantially, nodules scattered throughout all length of cecum.

- Absence of villi.

##### **2. Portal triad.**

**(3 marks)**

The liver is organized into lobules (portal lobules, hepatic lobules) which take the shape of irregular polygonal prisms.

Some texts refer instead to liver acini.

At the corners between adjacent lobules are the so-called portal areas (portal canals, portal triads). These are regions of connective tissue which include branches of the bile duct, the portal vein, and the hepatic artery.

Along the central axis of each lobule runs a central vein, which is a branch of the hepatic vein.

Occupying the bulk of the lobule are hepatocytes arranged into cords, separated by sinusoids.

Lobules appear quite clearly in pig liver, which has an envelope of fibrous connective tissue around each lobule. (This tough connective tissue is one reason why pig liver, unlike calf liver or chicken liver, is not a popular menu item.)

### 3. Circumvallate papillae.

(3 marks)

are the largest (up to 1/8 in diameter) papillae, are surrounded by a deep indentation of the mucous membrane and are not numerous. They do not rise above the surface of the tongue. Many taste buds are located on their sides. Serous Von Ebner gland empty into the moat. It also covered by st. sq. epith. C.T core is rich in blood vessels

### 4. Omasum.

(3 marks)

This organ has a number of colorful layman's names applied to it, among them "many-plies" and "the butcher's Bible," the latter referring to its similarity to the leaves of a book in gross appearance.

The omasum has muscularis mucosae which underlie the epithelium; but in addition to muscularis mucosae, there is an excursion of smooth muscle from the tunica muscularis up between the folds of the muscularis mucosae. What at first glance appears to be a "spine" of muscle running up through each of the "leaves" of the mucosa can be resolved on careful examination as a three-layered structure: muscularis mucosae on the outside, with tunica muscularis inside it. If you follow the central strand of muscle outwards you should find where it comes off the inner layer of the tunica muscularis. There is a very scanty bit of submucosa separating the two types of smooth muscle, but it's so tenuous that you may not be able to make it out.

If you were to pass a rod through a mucosal fold from side to side, you would go through the following sequence:

epithelium / lamina propria / muscularis mucosae / submucosa / tunica muscularis / submucosa / muscularis mucosae / lamina propria / epithelium.

**L. epith**, keratinized stratified squamous type, and there are no glandular elements.

**L. propria**, consists of collagen and elastic CT, dense subcapillary net work

**L.m.m**, thick layer of SMF just beneath the propria of the both side

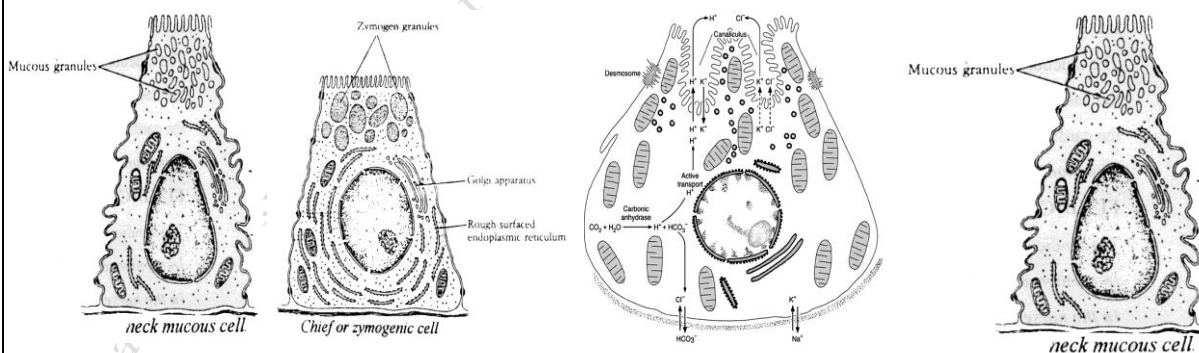
**Submucosa** consists of collagen and elastic fibers, blood vessels, nerves and lymphatics.

**Muscularis externa**, consists of 2 layers, outer thin longitudinal layer and inner thick circular SMF which is continue into the large omasal lamina

**Serosa**, loose CT covered by mesothelium

### B. Draw the ultrastructure of the horse stomach cells.

(4 marks)



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