Veterinary Histology BY: Dr.Ammar

It is synonymous with veterinary microanatomy, involves the examination and description of the microscopic anatomy of normal animal cells and their contents and products.

References:

1-Delman and brown 1989

2- Janquira 2003

3-Bacha and Bacha 2000

4- Samuelson 2007

Histology:

Is the study of the tissues of the body and of how these tissues are arranged to constitute organs.

Four fundamental tissues are recognized:
epithelial tissue,
connective tissue,
muscular tissue,
and nervous tissue.

In fact histology has a direct relationship to other disciplines such as:
Cell biology
Biochemistry
Physiology
and Pathology

Basic histological techniques(Tissue preparation)

- Steps required in preparing tissues for light microscopy examination includes:
- 1 – Fixation
- 2 - Dehydration
- 3 – Clearing
- 4 – Embedding
- 5 –Mounting and cutting
- 6 - Staining the sections .

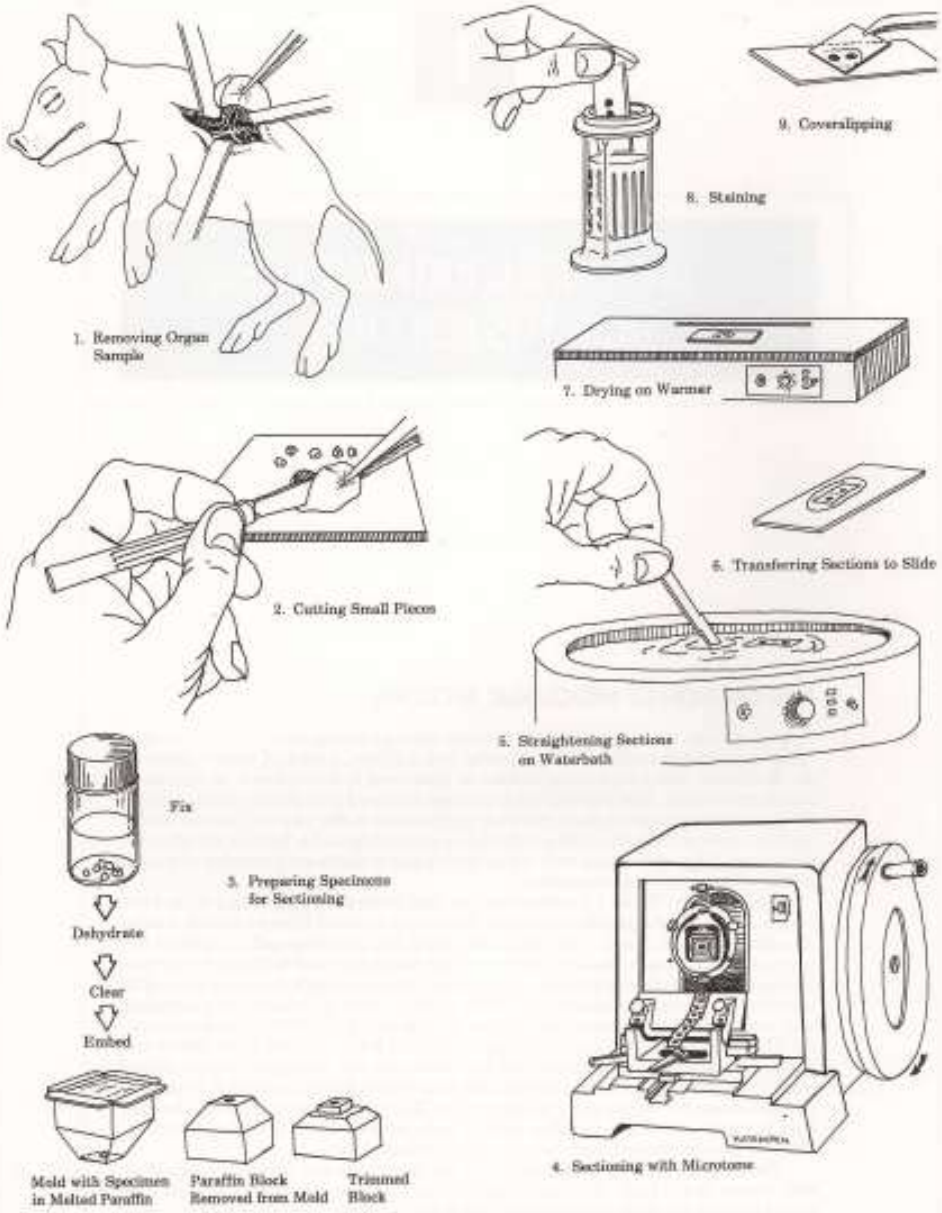


Figure 1.1. The various steps involved in producing a histologic slide using the paraffin method.

Cytology

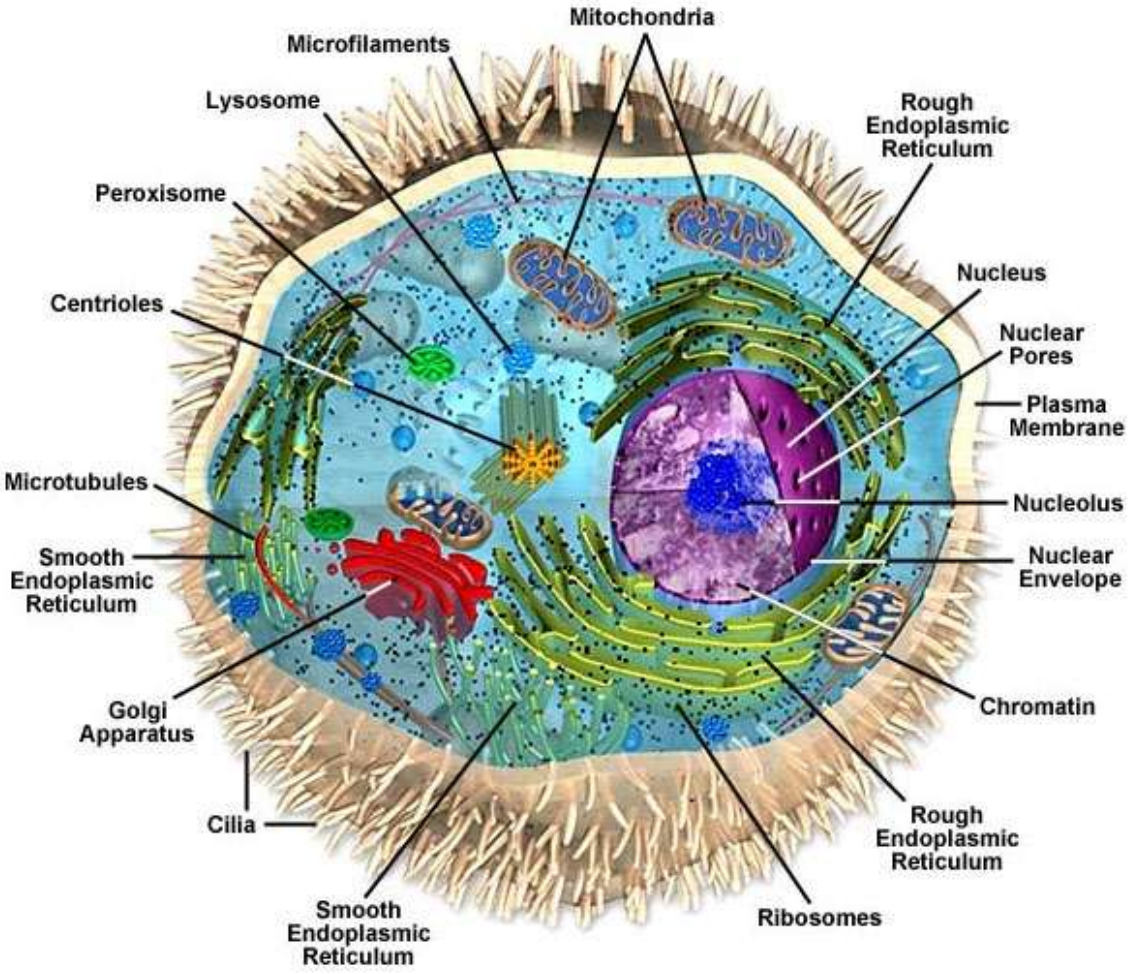
- Cell : A mass of protoplasm surrounded by a membrane and containing a nucleus, organelles and inclusions. Its a fundamental unit of life.
- Different cells have also different sizes , some cells are small e.g. : some cells in the brain are only 4 microns , other are large e.g. : human ovum may reach up to 120 microns . (1 mm = 1000 micrometer)

- There is no correlation between the size of animal and the size of it's cells , the cells of the Elephant are about the same size as the cells of mouse.

- The cells are the basic functional units of complex organisms and according to the function the cells are differ in the shape, size and structure. The cells may be oval , cuboidal , squamous or star shape (contain cytoplasmic process) .

- Protoplasm: it is a living substance of cell includes the cell components cytoplasm, nucleus, and nucleolus.

- Cytoplasm: is an intracellular matrix extends from the cell membrane to the nucleus and contain the organelles and inclusions.


Mitochondria
Microfilaments
Lysosome
Rough Endoplasmic Reticulum
Peroxisome
Nucleus
Centrioles
Nuclear Pores
Plasma Membrane
Microtubules
Nucleolus
Smooth Endoplasmic Reticulum
Nuclear Envelope
Chromatin
Golgi Apparatus
Cilia
Rough Endoplasmic Reticulum
Smooth Endoplasmic Reticulum
Ribosomes

Organelles :

- Organelles are dynamic components that can increase or decrease in size, number and they are active metabolically include:
- 1 – Cell membrane (plasma lemma , plasma membrane) .
- 2 – Rough endoplasmic reticulum.
- 3 – Smooth endoplasmic reticulum.
- 4 - Golgi apparatus.
- 5 – Mitochondria.
- 6 – Lysosomes.
- 7 – Centrioles.

Inclusions :

- Are considered to be non living components of the cell, have not metabolic activity, and include:
- 1 – Glycogen .
- 2 – Lipid droplets .
- 3 – Pigments .
- 4 – Microfilaments .
- 5 – Microtubules .

Nucleus :

- The nucleus is the main fundamental component. The genetic material that it holds DNA deoxyribonucleic acid, directs synthesis of proteins and polypeptides through the process known as transcription. The nucleus is usually spherical and is centrally located in the cell; However, in some cells it may be elongated, kidney like shape, lobulated or even disk shaped. Although, usually each cell has a single nucleus, some cells (Osteoclast) posses several nuclei. The nucleus contain the following components: (nucleoplasm ,nuclear membrane , chromatin , nucleolus)

- The nucleus components are enveloped by two nuclear membranes; the outer one is continuous with the rough endoplasmic reticulum and contain several ribosomes, the two membranes are fused with each other at certain regions to form perforations known as nuclear pores which are enclosed by thin membrane to allow the exchange between nucleus and cytoplasm.
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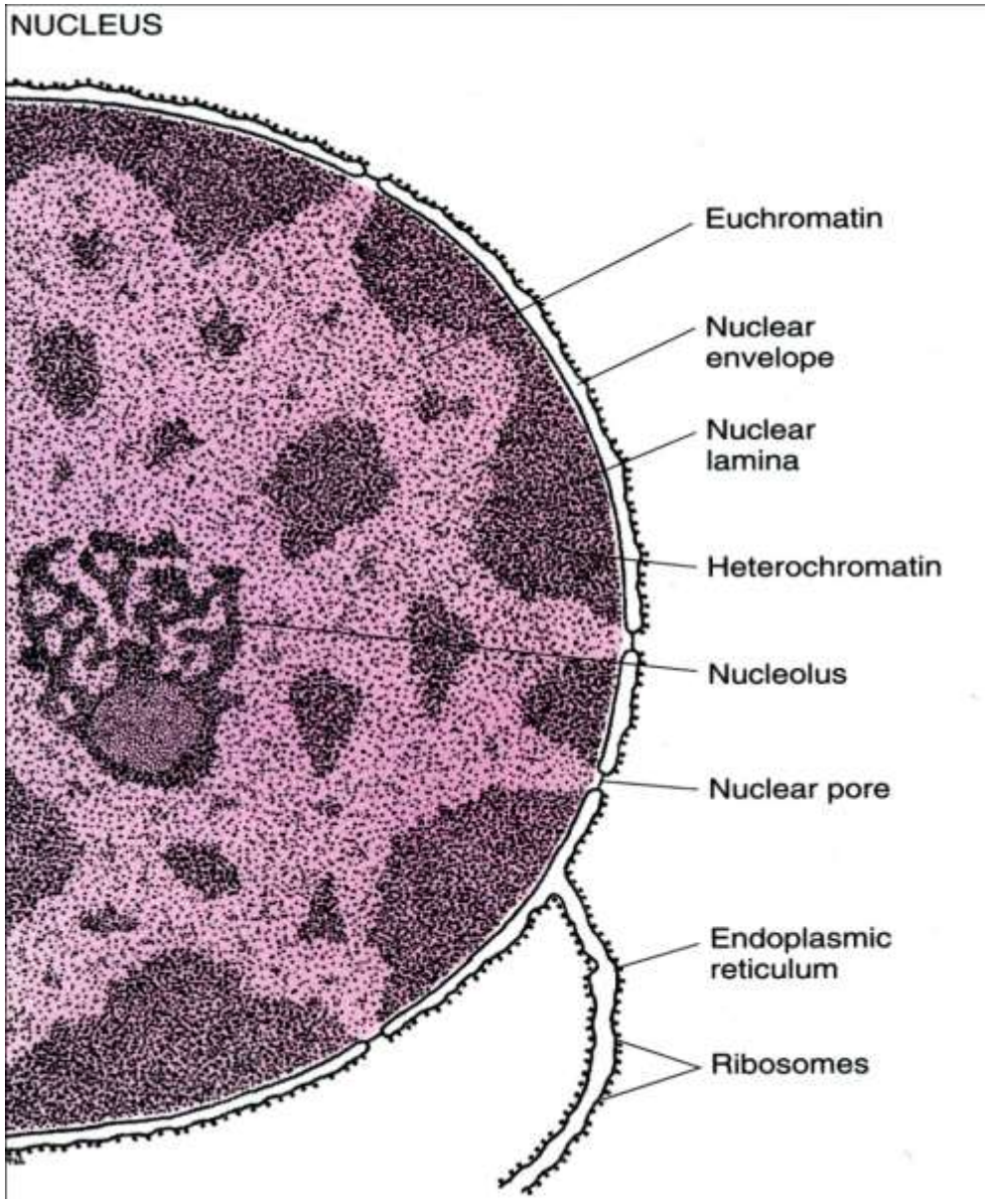
The nucleus contain chromatin which embedded in the nucleoplasm , the chromatin is a complex of DNA and protein
According to the degree of chromosome condensation there are two types of chromatin can be distinguished by electron microscope .
Hetrochromatin : in active form of chromatin, dense aggregates located in the periphery of nucleus, being relatively coiled .

Euchromatin : active form of chromatin scattered through the nucleus where the genetic material of DNA molecules is begin transcribed into RNA, less tightly packed and forming translucent region of nucleus .

Nucleolus :
It is a spherical deeply stained, non membrane bounded structure, composed mostly the protein and RNA and small amount of DNA, the main function is to synthesize the major components of ribosomes .


NUCLEUS
Euchromatin
Nuclear envelope
Nuclear lamina
Heterochromatin
Nucleolus
Nuclear pore
Endoplasmic reticulum
Ribosomes

Cytoplasm:

- Its surrounds the nucleus and enveloped by the cell membrane .It's that region of the cell involved in energy formation and releasing ,protein synthesis ,growth, motility, and phagocytosis. The cytoplasm can be subdivided into regions or zones based on the general location of organelles and consistency:

- 1-Cytocentrum: The cytoplasm next to the nucleus which consist of narrow gelatinous region void of organelles except for endoplasmic reticulum attached to the nuclear envelope, a pair of centrioles.

- 2- Endoplasm: Adjacent to the cytocentrum ,it's a largest region of cytoplasm and less viscous and hoses most of the structures components of cytoplasm.

- 3- Ectoplasm: External to the endoplasm and adjacent to the cell membrane, it's very narrow zone, jelly like and has very few organelles.
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Endoplasmic reticulum :

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- It is a cytoplasmic structure composed of an anastomosing net work and sacs formed by continuous membrane which encloses a space called cisterna, there are two type of this membranous system rough and smooth.

- **Smooth endoplasmic reticulum** : (sER)
- It's also take the form of membranous tubules , it s differ from the rough in the lacks the associated polyribosome .
- It s responsible of production the steroid hormones , phospholipids ,carbohydrate synthesis ,detoxification. storage high level of calcium

- **Rough endoplasmic reticulum** : (rER)
- It have the ability to synthesis the protein (lysozyme) . it is consist of sac like as well as parallel flattened cisterna limited by membranes that are continuous with the outer membranes of nucleus . The name rough endoplasmic reticulum according to the presence of polyribosome on the surface therefore sometime it’s called granular endoplasmic reticulum .

Golgi complex (apparatus) :

- It is a tubular network and flattened cisterna found near the rough endoplasmic reticulum , it is responsible of generation vesicles that will transport proteins
- cytochemical method shown the Golgi apparatus present different enzymes.

Lysosomes :

- Are membrane-limited vesicles formed from Golgi apparatus , contain enzymes , therefore it is consider as a sites of intracellular digestion which a common function .

Mitochondria :

- It is consider as a source of energy which provide the ATP in the cell.
- The mitochondria posses a smooth outer membrane and a folded inner membrane. the folds of inner membrane known as cristae to increase the surface area and in the same time it has granules contain enzyme .