Histology and Embryology

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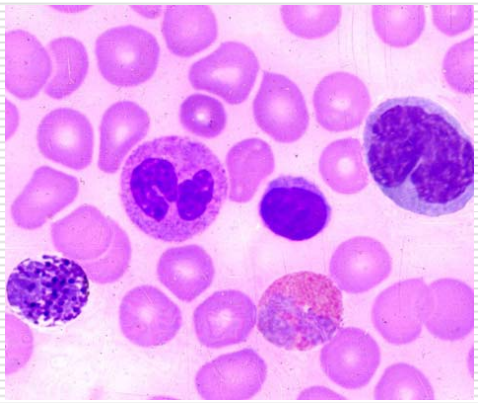
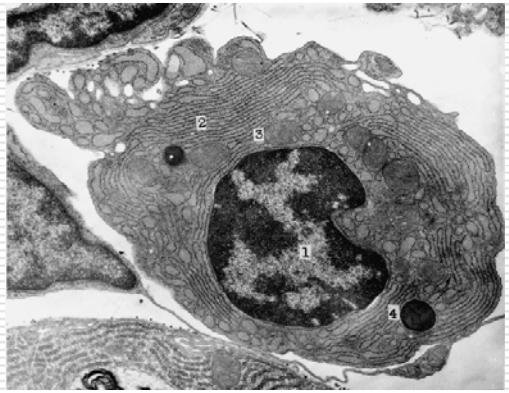
and Embryology

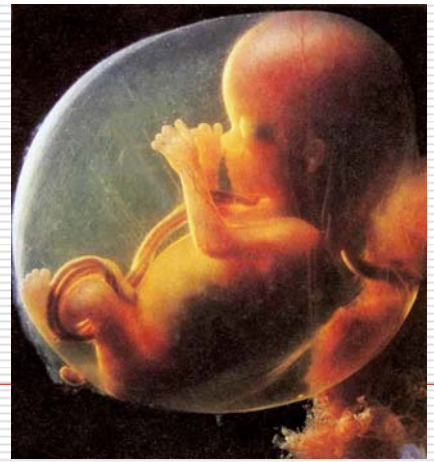
Chapter 1 Introduction of Histology

Ⅰ. What is Histology?

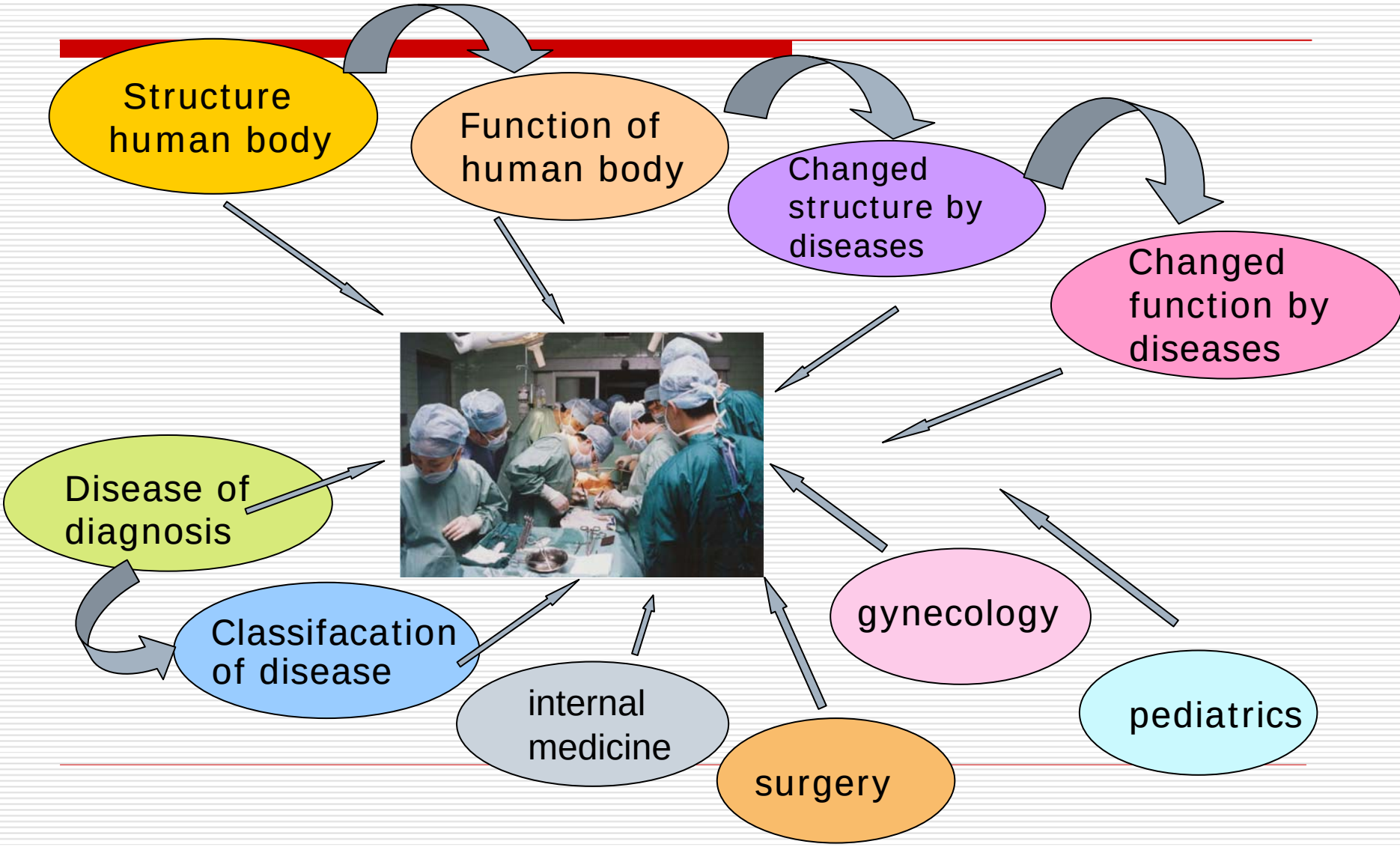
Histology is the study of the fine structure of human body and its related functions.







The Important Standing of Histology in medicine



- organ and system (anatomy)
- 1665 year, Robert Hook (English)-----cell
- 1801year, Bichat (French)------tissue (from French)
- 1838 yearT. Schwann and M. Schleiden (Germany) “Cell theory”

epithelial tissue, connective tissue, muscular tissue and nerve tissue

Ⅱ. Histologic Methods

1. Preparation of Tissue Section

Measure unit：micrometer, μm (0.2 μm)

1.1 Fixation

To avoid tissue digestion by enzymes within the cells or by bacteria and to preserve the structure and molecular composition

Fixative: formaldehyde, alcohol so on

1.2 Embedding

- dehydration: ethanol (graded series)
- clearing: xylene
- Paraffin embedding (routine)

1.3 Sectioning

Microtome, 5-10 μ m tissue section

Microtome


Drive wheel
Block holder
Paraffin block
Tissue
Steel knife

Cryostat: frozen section

Smear

Spread section

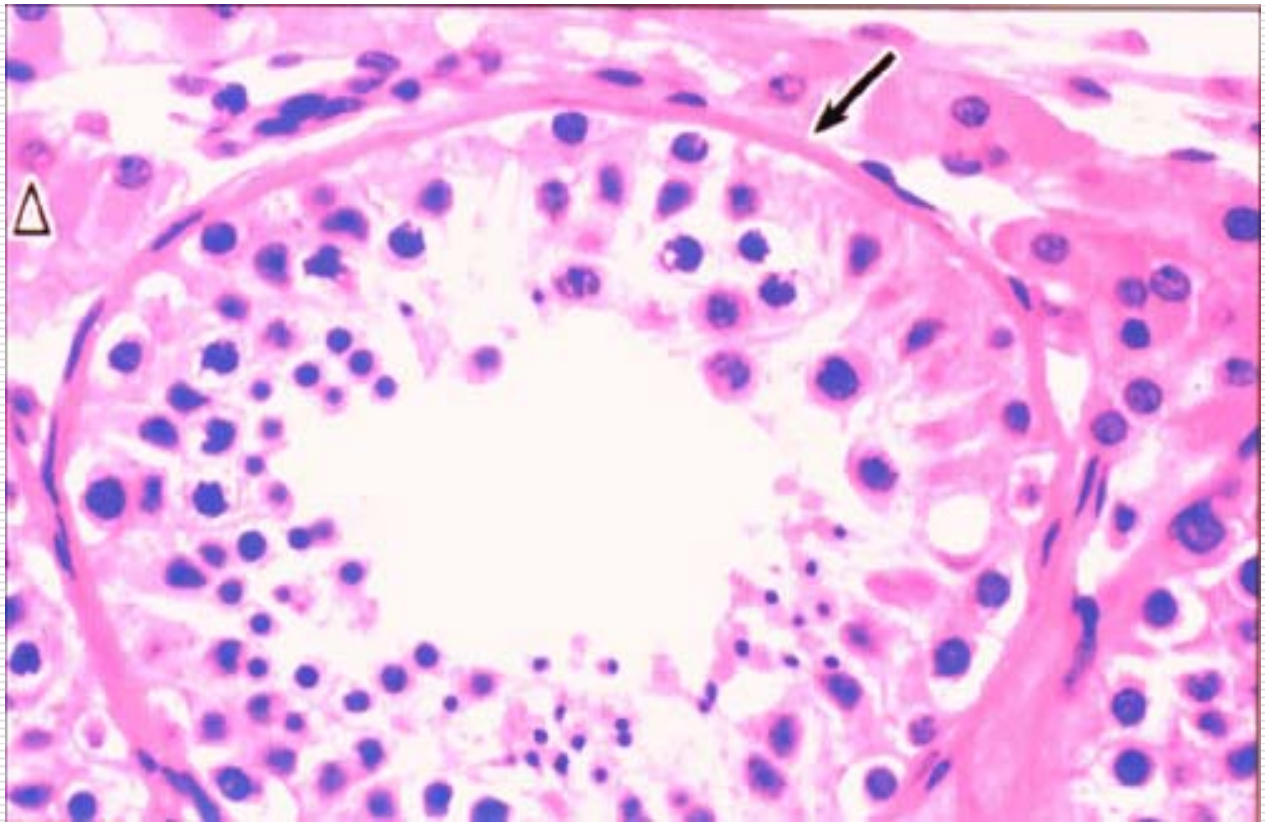
Ground section

1.3 Staining

Hematoxylin and eosin, HE stain

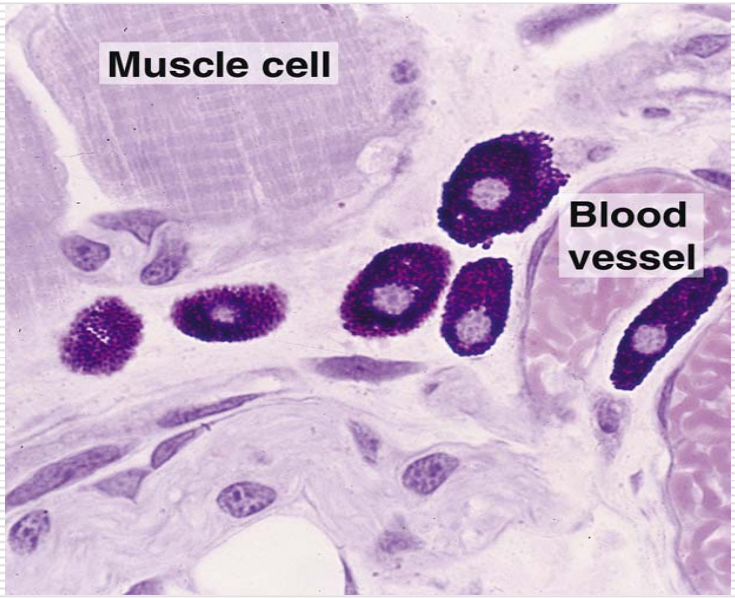
Basophilia, acidophilia, neutrophilia

H-E stain



1.4 Dehydration and clearing

1.5 Mounting



III.Electron microscopy

Light wavelength: 369-760nm 0.2 μ m

Electron beam wavelength: 0.012nm

1932 Year, Ruska and knoll, EM

Resolution: 0.2nm (1nm=1/1000 μ m)

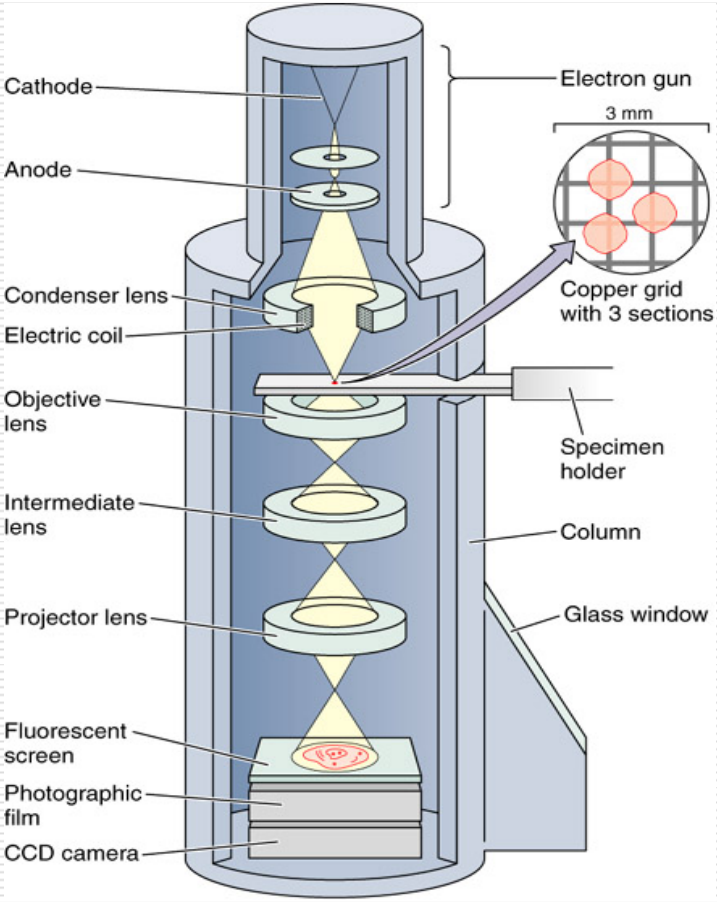
Transmission electron microscopy, TEM

ultrathin section: ultramicrostome 50-80nm

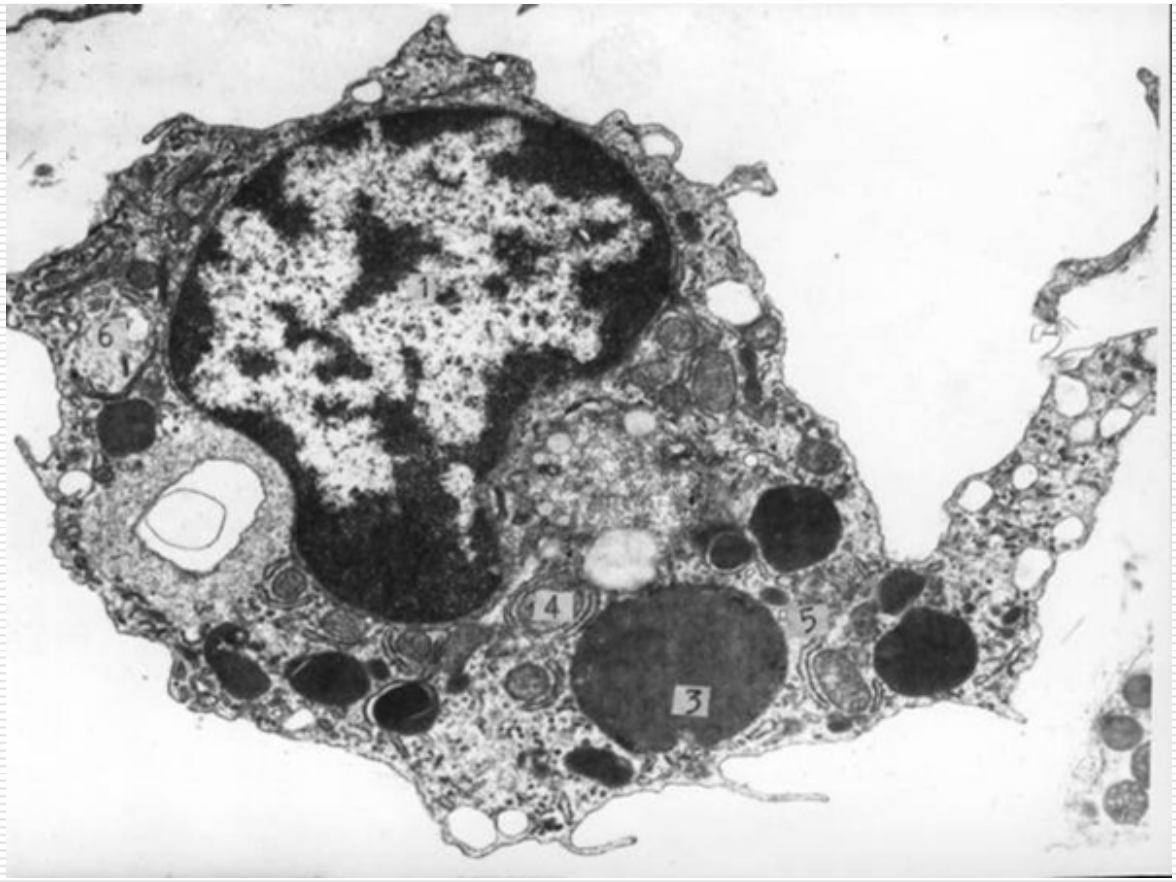
Electron dense Electron lucent

Electron Microscope

Principle of Transmission Electron Microscope



The Image of TME



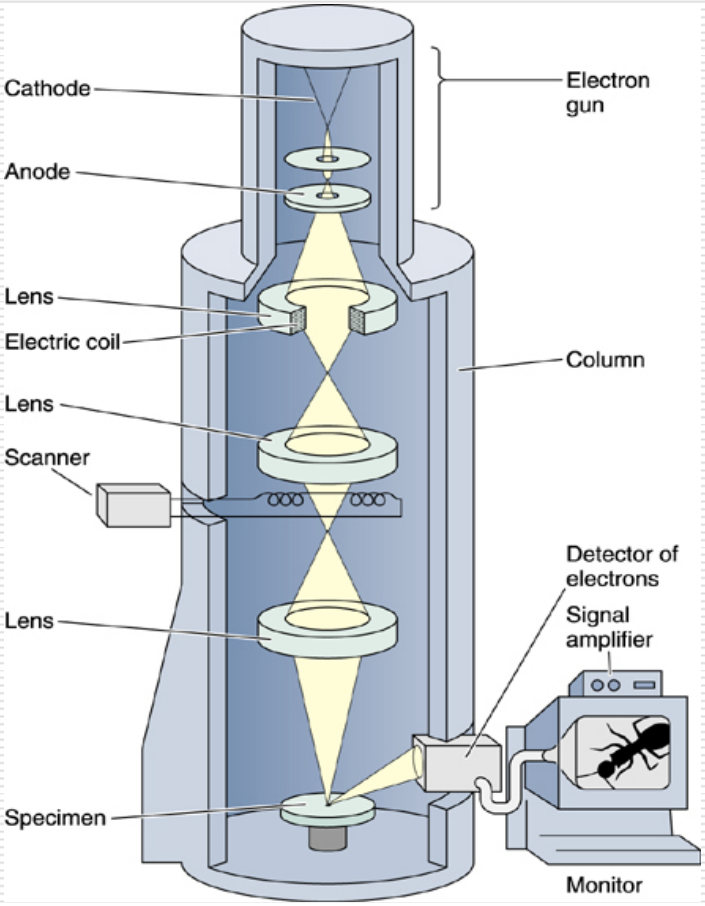
2. Scanning Electron Microscopy, SEM

Principle:

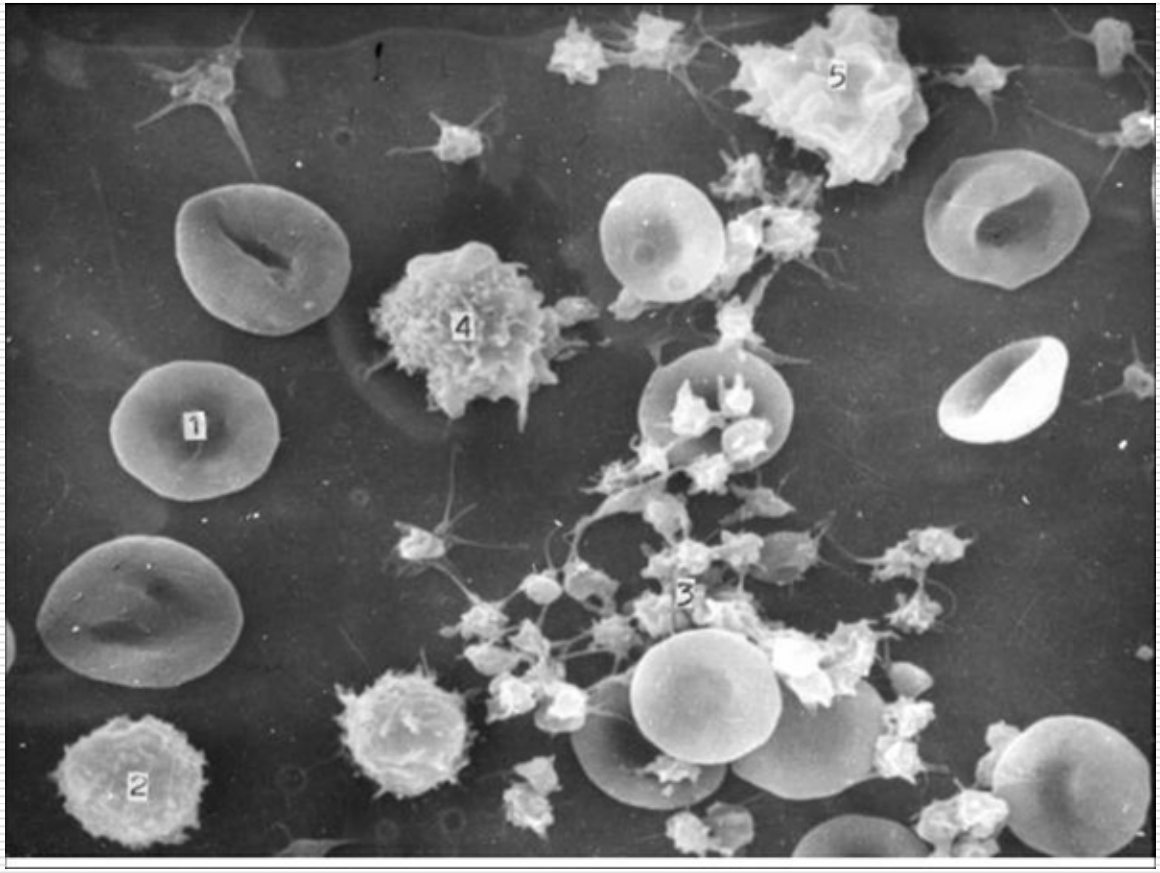
The SEM shows only surface views

Freeze etching: the inside of organs can be analyzed by freezing the organ and fracturing them to expose their internal surfaces.

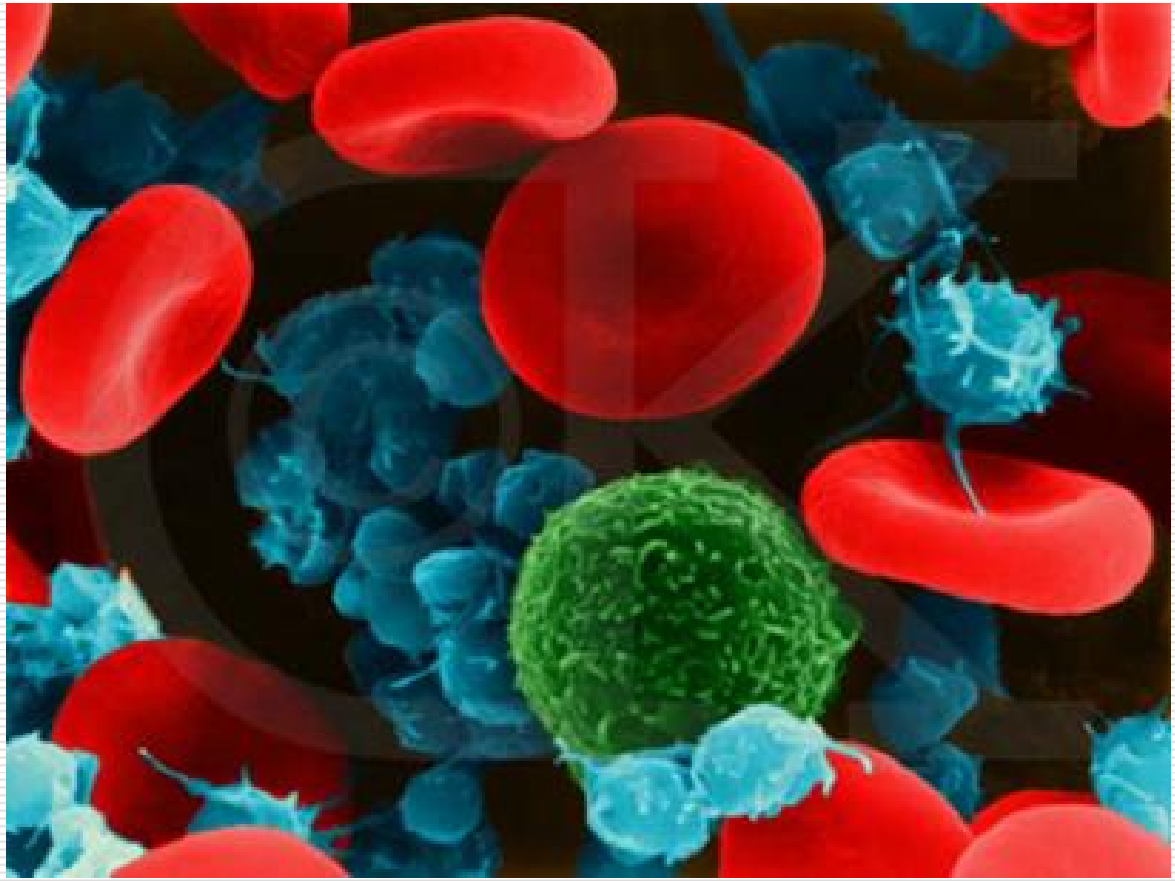
Scanning Electron Microscope



The Image of SEM



The color Image of SEM



Ⅳ.Histochemistry and Cytochemistry

Principle: The terms are used mainly localizing different substances in tissue sections. Most of them based on specific chemical reactions or on high-affinity interactions between macromolecules.

1. Periodic acid Schiff reaction,PAS

Polysaccharides → HIO4 → 2 -

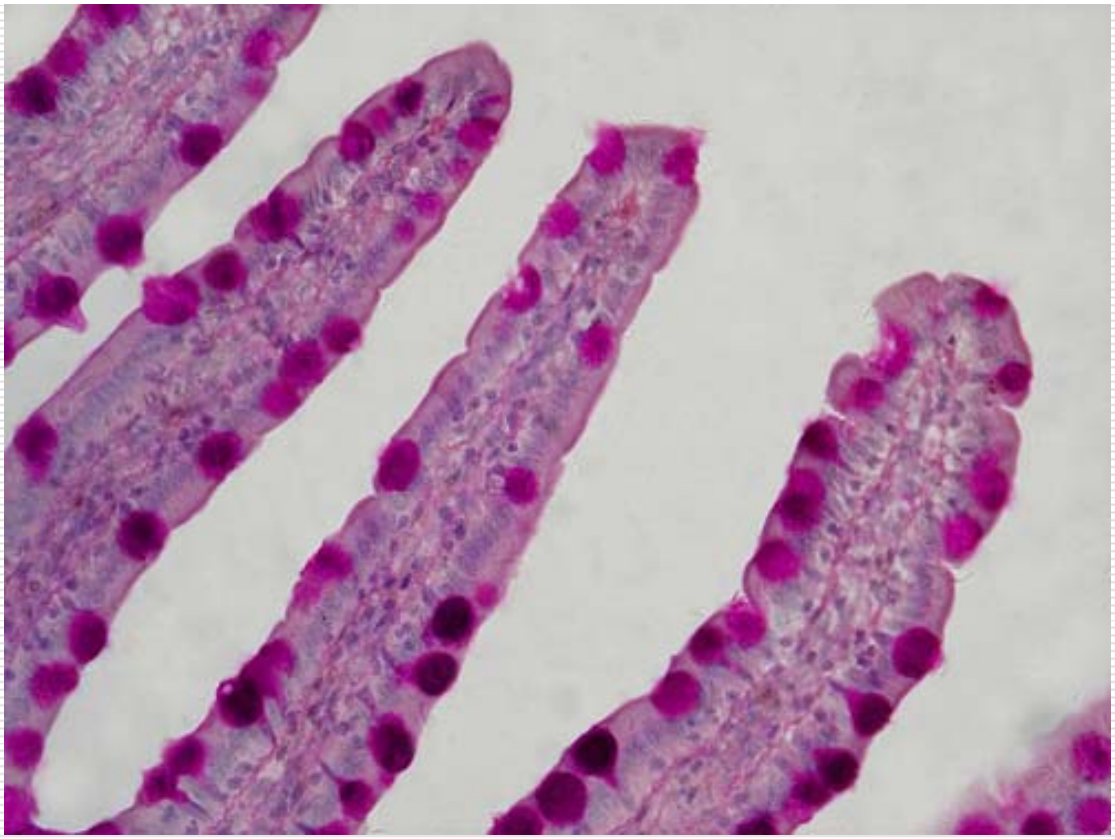
(多糖）

glycol groups + Schiff reagent →

（多醛）

purple color in areas of polysaccharides

PAS reaction of intestinal villus



Ⅴ. Immunohistochemistry

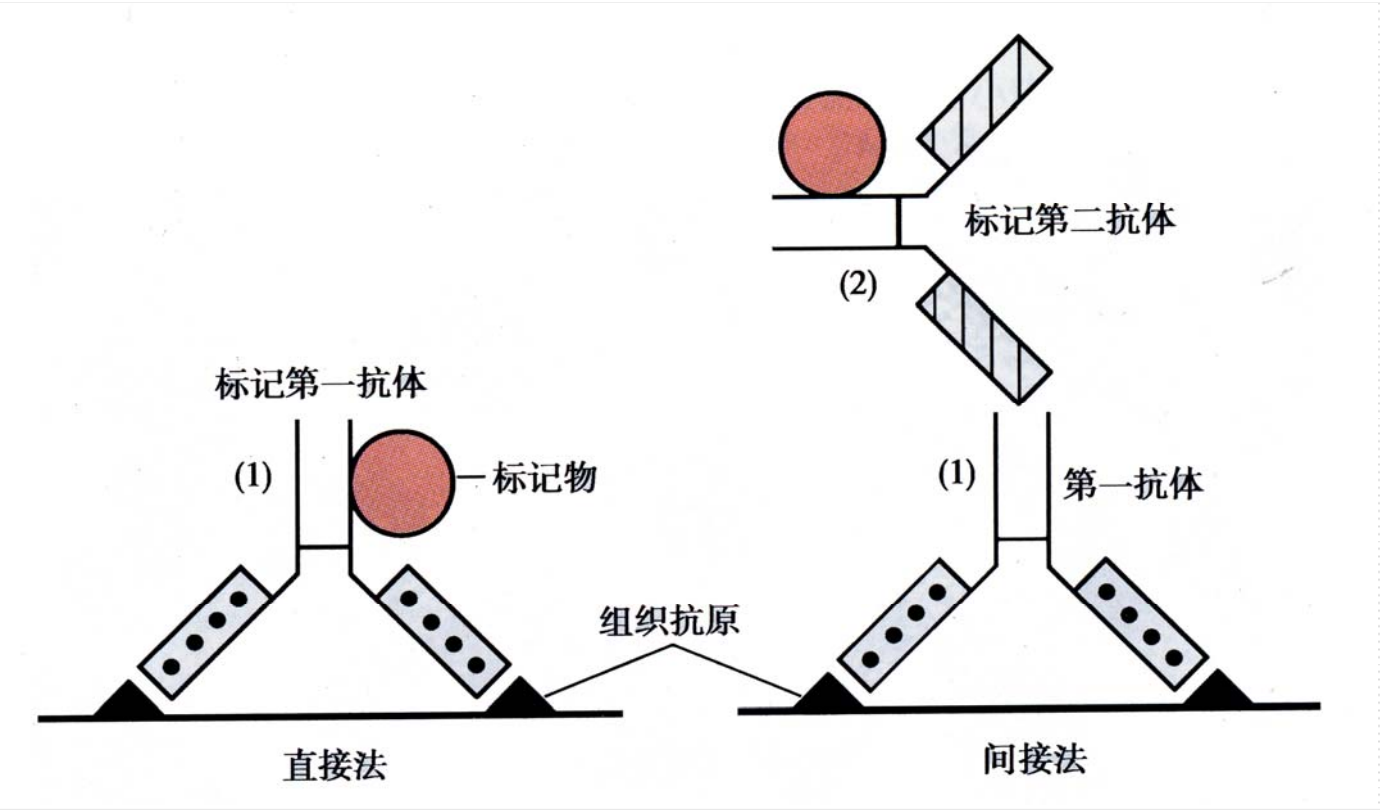
Principle: to identifying and localizing the polypeptide and the protein in cell a highly specific interaction is that between an antigen and its antibody

Fluorescent (FITC,TRITC,Cy3,Cy5)

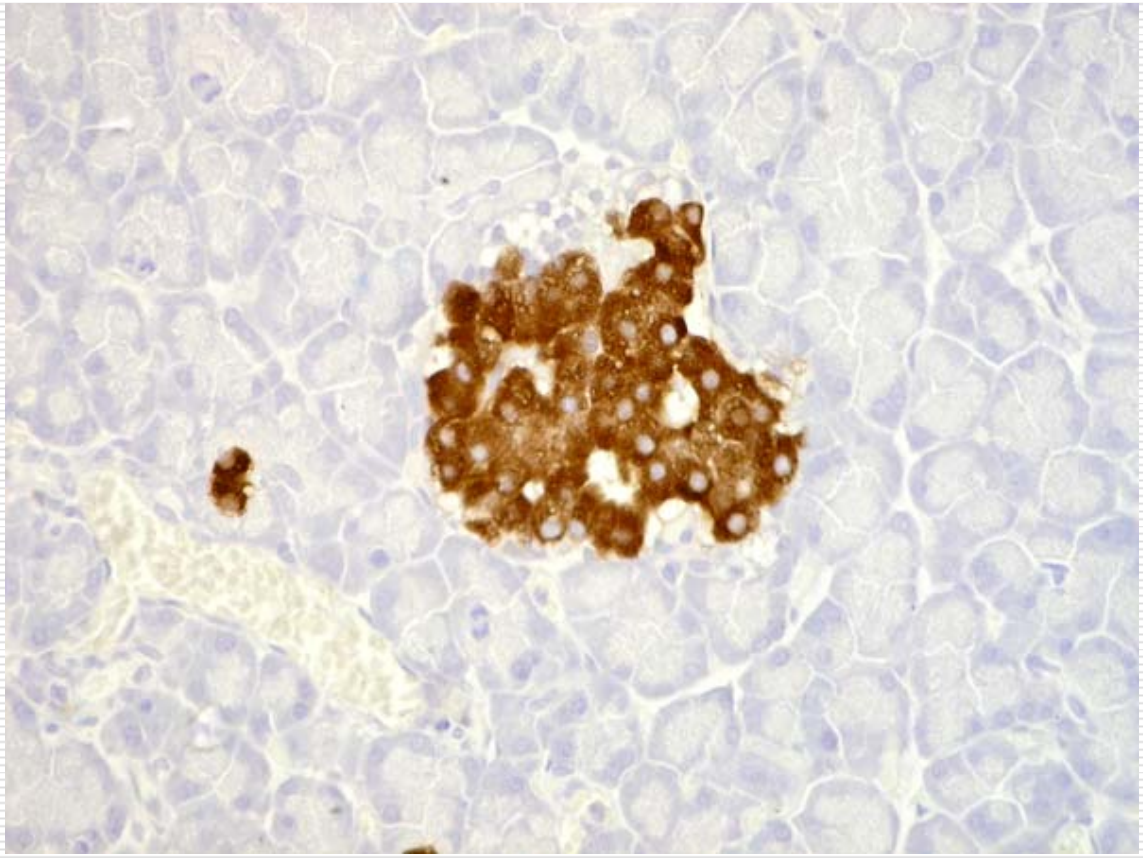
Peroxidase as a label

- The direct and indirect methods

Direct and indirect methods

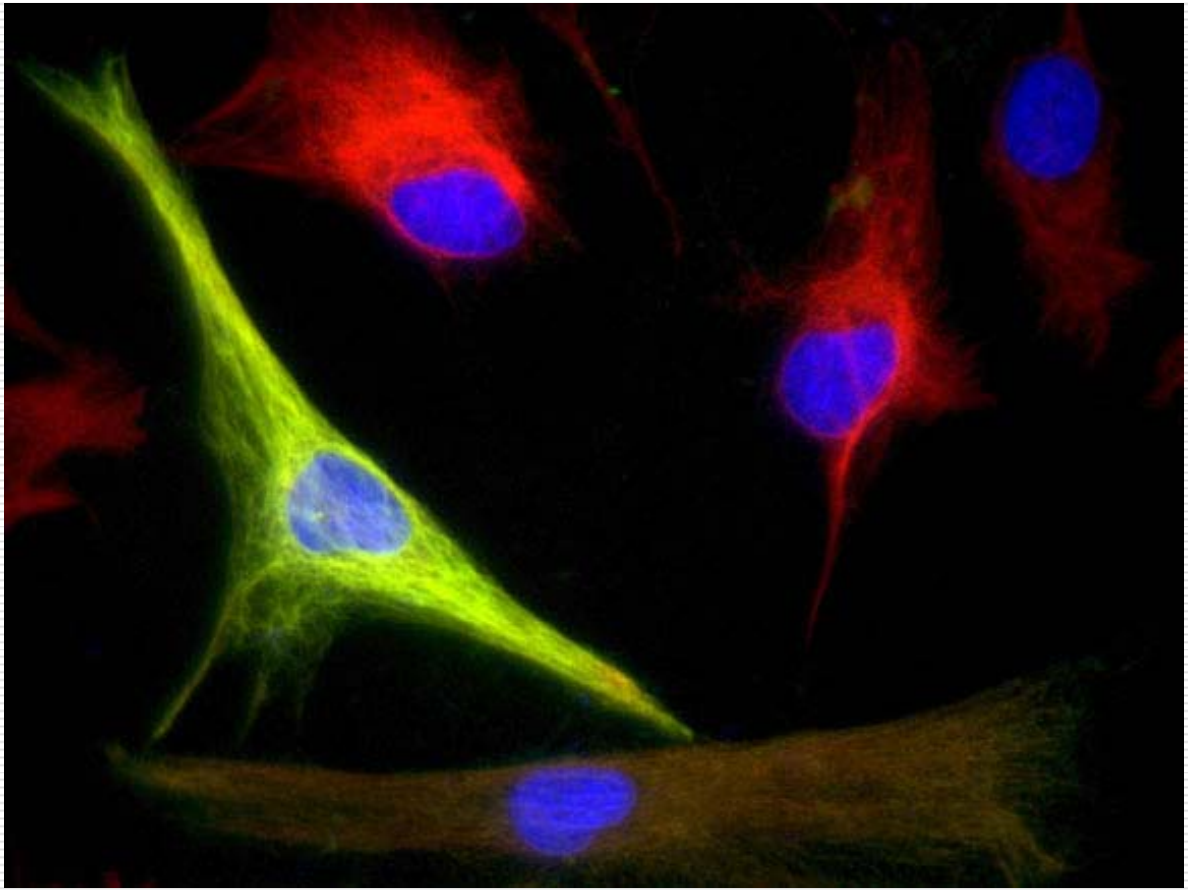


Immunocytochemistry



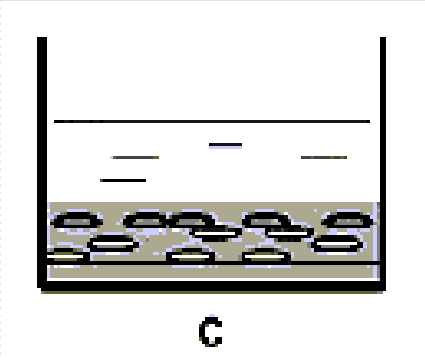
Fluoresence microscope

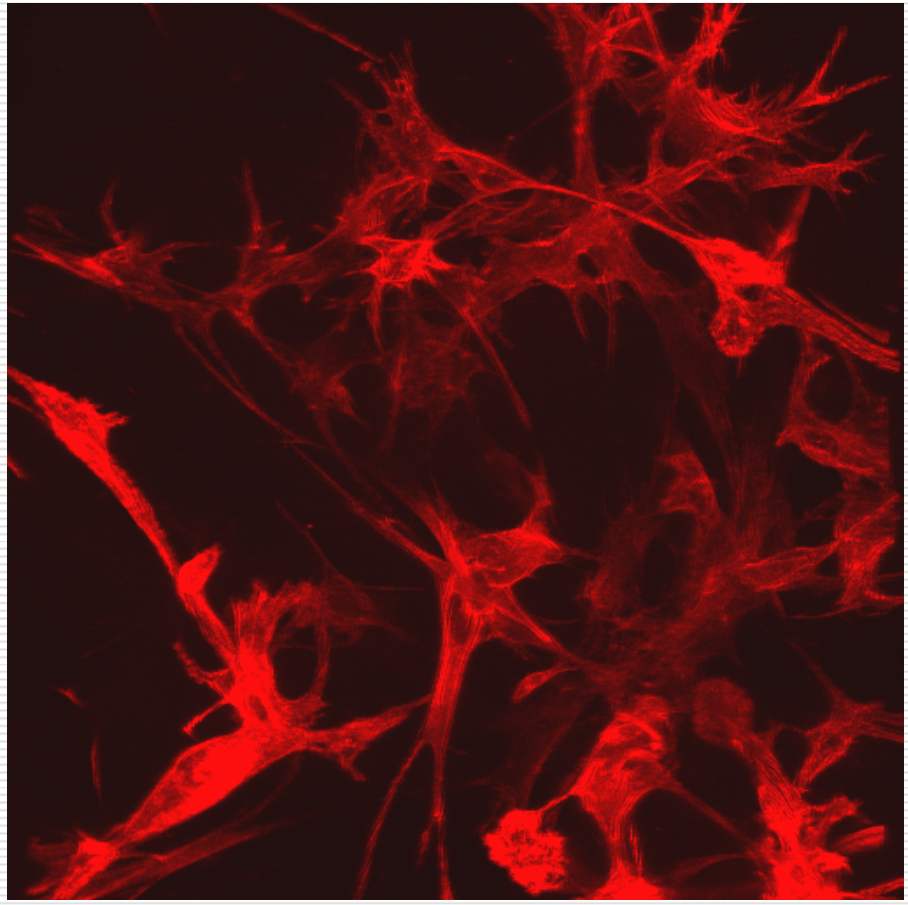
Fluorescence Immunocytochemistry



Laser scanning confocal MIC.

3D image





Ⅵ. Study method of live tissue and cell

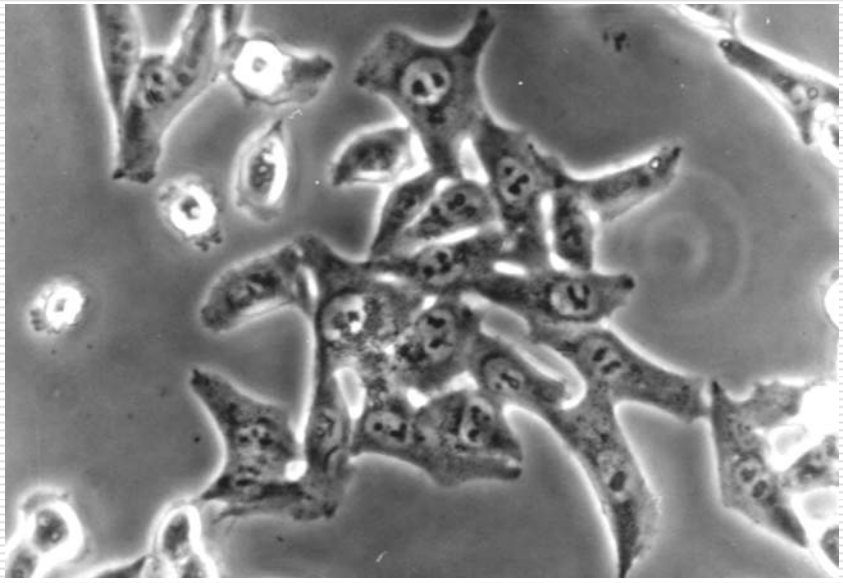
1. Cell and tissue culture

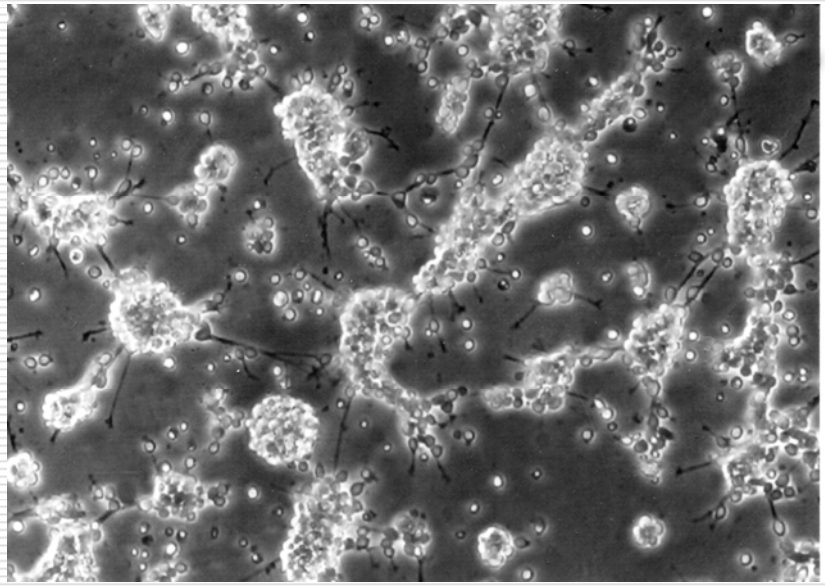
Live cells and tissue can be maintained and studied outside the body.（in vitro）

To avoid complex elements in vivo and observe the effect of single element on cell and tissue

Inversion phase contrast MIC.

cell culture





Highlight of this chapter

1. What is Histology and tissue?
2. Preparation of paraffin section
   (basophilia, acidophilia)
3. What is observed by TEM, and by SEM in cell and tissue (electron dense and electron lucent) ?
4. What is PAS?