



PATHOLOGY TEAMWORK
MED444



Introduction to pathology

Editing File



Color index:

Main text (Black)

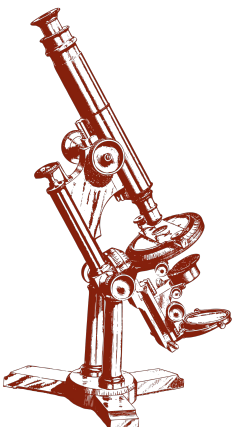
Female slides (pink)

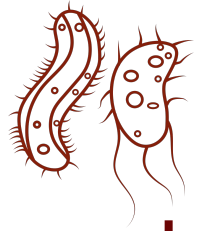
Male slides (blue)

Important (red)

Dr's note (green)

Extra Info (grey)





Objectives

- Understands the role of pathology and its various subspecialties in the diagnostic process with special emphasis on histopathology and cytology.
- Understands the meaning of the terminology used during the study of a disease like aetiology, pathogenesis, prognosis, sequelae, symptoms, signs, incidence etc.
- Role of diagnostic pathology in disease management.
- Be aware of some of the principle techniques used in pathology like light microscopy, cytology,
 - immunohistochemistry and molecular pathology.
- Have a basic knowledge of the definition of autopsy and its indications.





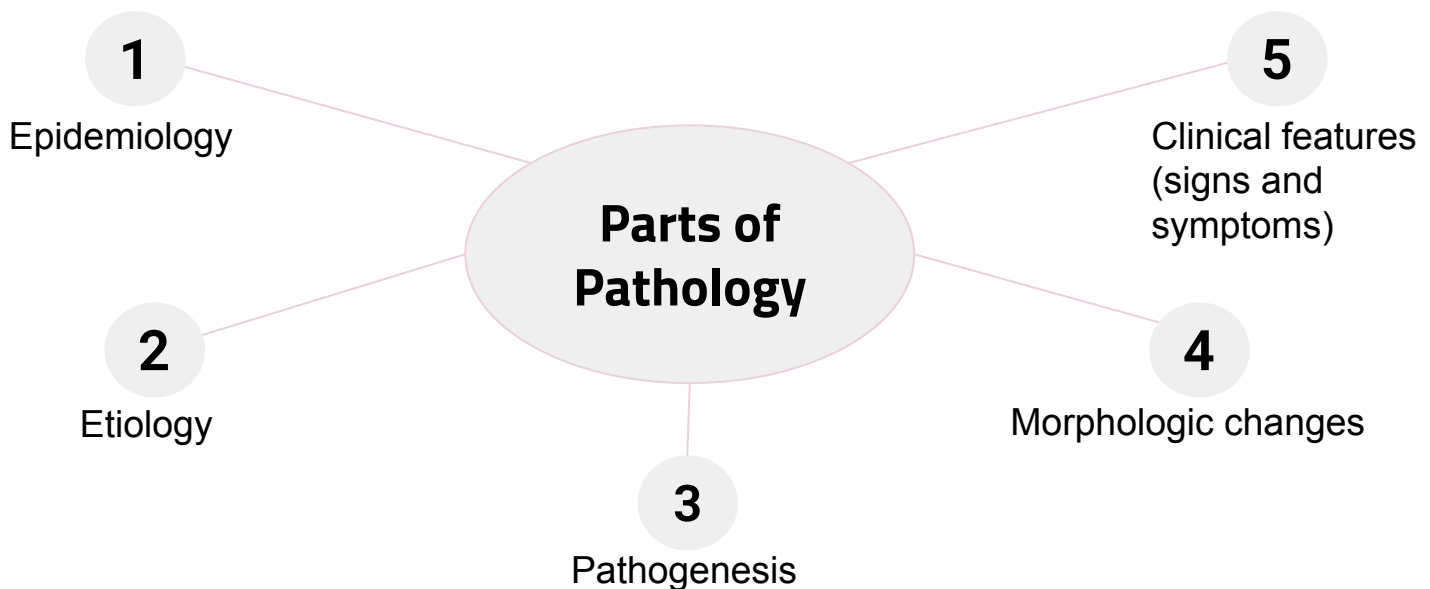
DEFINITION

Pathology:

is the study of disease by scientific methods. It is the study of changes which occur in cells and tissues as a result of any injury to the cell or tissue

Disease:

is defined as an abnormality in structure or function of any part of the body.



1. EPIDEMIOLOGY

DEFINITIONS

Study of the occurrence and **distribution** of diseases in a **population** and the application of this knowledge to help the health system. It is the study of the patterns, causes, and effects of disease conditions in various populations.



Factors of epidemiology:

1 Sex

2 Age

3 Race

4 Occupation

- workers in asbestos(مادة الاسمنت) industry → can have diseases like asbestosis (chronic lung condition) or tumors like mesotheliomas (cancer that occurs in the lining of the lungs)
- workers in aniline dye industry → can have urinary bladder cancer,
- hardwood workers → can have nasal cancer (from inhalation of wood dust etc)

5 Geographic location

- which part of the world a particular disease is common in, e.g. underdeveloped countries has more malnutrition and infections like tuberculosis.
- developed countries have more cardiac problems, obesity related diseases etc.

6 Socioeconomic strata

- what is the social and financial status of the people affect by a particular disease.

7 Prevalence

- is the total number of cases of a particular disease in a particular population in a particular period of time

Important to know the difference!!!!

Prevalence: all cases in a particular time

Incidence: new cases in a particular time

8 Incidence

- is the number of new cases of a particular disease in a particular population in a particular period of time (immunization programmes affect the incidence of a disease)

9 Sequalea

- is the complication or the consequence of a disease.

cont. Factors of epidemiology:

10 Prognosis

- is the expected outcome of the disease based on severity of any disease.

التشخيص (diagnosis): هو عبارة عن معرفة المرض.

المسار بعد التشخيص (prognosis): بعد التشخيص يبيصير تغيرات في حياة الشخص من اسلوب حياه والى اخره مهم جدا فهم المصطلحين وليس فقط حفظهم.

11 Morbidity rate

- number or percentage of people who have the disease(is the presence of illness)

12 Mortality rate

- number or percentage of people who have died in a particular population during a particular period of time.
- Mortality rate can be calculated for any particular disease: e.g. mortality rates are high for people with high grade cancers.

importance of Epidemiology:

1. Investigate the extent of a disease in a community.
2. Study natural pattern/history and prognosis of disease.
3. Identify causes and risk factors.
4. Provide good health care based on the findings.
5. Recommend and assist in various health programmes to prevent or treat disease (preventive and therapeutic measures), e.g. immunizations and screening programs for different disease etc.
6. Evaluate all healthcare facilities and programs.
7. Provide information on public health in order to help the health care system and develop health policies.



2- Etiology and classification of disease


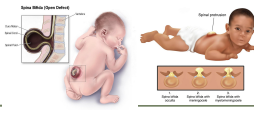
DEFINITIONS

-Etiology means the cause of the disease

-If the cause of the disease is unknown it is called **idiopathic/ cryptogenic/ essential** etc.

-Diseases are classified depending on the etiology and pathogenic mechanism involved:

- A. **congenital**: a condition existing at birth or before birth, or that develops during the first month of life.
- B. **acquired**

Type	Category	Example
Congenital:	Genetic or chromosomal	-Hemophilia -> x chromosome linked -Down syndrome → abnormality in chromosome 21 -Inborn error of metabolism
	Non-genetic: Abnormal defect that the child is born with	Cleft lip  Spina bifida 
Acquired	Inflammatory	- Rheumatoid arthritis
	Infective	- Bacterial - Fungal - Viral
	Vascular	Atherosclerosis (heart attack) or immune mediated e.g. vasculitis
	Degenerative	- Alzheimer's - Parkinsonism
	Neoplastic (growth disorder)	- cancer
	Therapeutic or reactionary drug associated disease	- certain drugs cause: Liver or kidney failure Bone marrow suppression Skin rash - alcohol : Liver disease Paraquat poisoning damages the lungs - excessive smoking : Lung and cardiac
	Metabolic	- Gout - Diabetes Mellitus
	Nutritional deficiency disease	- Anemia - Protein energy malnutrition
	Radiation	- To neck → thyroid cancer - To skin → skin cancer(squamous cell carcinoma)
	Mechanical	- Road traffic injury -Burns



3. Pathogenesis

DEFINITIONS

it is the steps that take place in the body once the problem begins (whatever it may be) that finally lead to tissue injury (pathological manifestations).

The four basic pathogenetic mechanisms (or steps that usually take place in diseases) are as follows:

1. Inflammatory process

2. Degenerative process

3. Carcinogenesis: transformation of normal cells to malignant

4. Immunological process

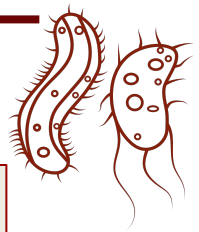
- All these will be dealt with in later chapters
- Pathogenesis leads to morphologic changes (changes in the gross or microscopic appearance of human tissue)

4. Morphologic changes

-The morphologic changes are the structural changes that take place in cells or tissues due to any disease.

-These morphological changes can be seen grossly (called **macroscopic findings**) with the naked eye or sometimes they can only be seen under the light microscope (called **microscopic/histologic findings**).

-Commonly diseases have certain specific gross or microscopic changes and this helps in the diagnosis of that disease.



5- Clinical features (functional alterations) :

Definition

When an organ is damaged, its normal function will be affected, leading to the development of certain clinical changes known as signs & symptoms. (The combination of signs and symptoms is called as clinical features).

Symptoms	<p>Something experienced and reported by the patient . I have a headache', 'I have a pain in my stomach' etc. Basically it is what the patient will tell the doctor</p>
signs	<p>The findings discovered by the physician during examination of the patient. e.g. doctor finds a swelling somewhere in the abdomen etc. Basically it is what the doctor will find on examining the patient.</p>

Pathology



THEREFORE IN MEDICINE, DISEASES ARE STUDIED UNDER THE FOLLOWING HEADINGS:

1 Definition

2 Epidemiology of disease

3 Etiology

4 Pathogenesis and pathophysiology

5 Morphology: it is divided into:
- Gross/ macroscopic- visible to the naked eye
- Microscopic- visible under a microscope

6 Clinical features/presentation: signs and symptoms

7 Differential diagnosis: is there any other alternative diagnosis/diagnoses with similar findings

8 Treatment and management

9 Prognosis



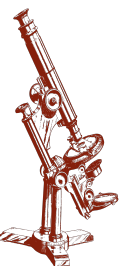
Course of disease

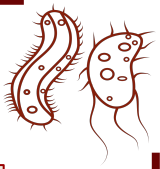
Definition

The course of a disease is the different stages in the natural history or progression of a disease in the absence of any intervention.

The different stages in the natural history or course of a disease especially infectious are as follows:

A	Exposure to causative agents or risk factors
B	There is a latent period between exposure and onset of disease. The time period from the exposure to the development of signs or symptoms is called as incubation (induction) period.
C	Onset of disease: the beginning of signs or symptoms.
D	Outcome and consequences of disease: Following clinical onset, disease may follow any of the following trends: 1/Recovery/resolution of disease without complication or sequalea. Person is back to normal health. 2/The disease recovery but with sequalea (side effects). 3/Complications: development of complications in any disease can make things worse. 4/ Death.





The diagnostic process and the role of pathologist

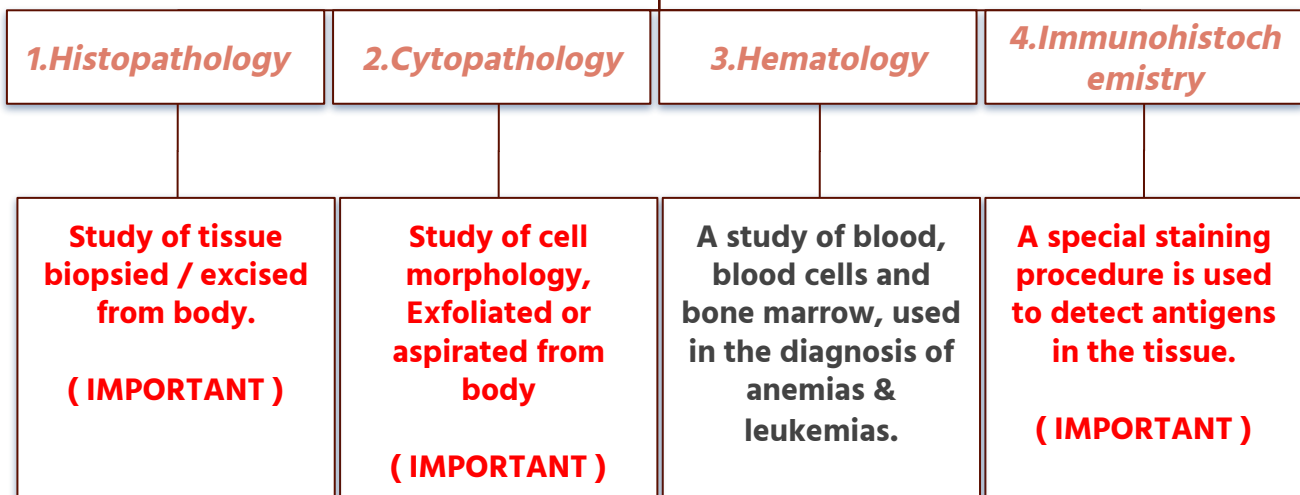
- Any patient going to a clinic meets clinician who will take history and do clinical examination. He may ask for radiological and pathological examination in order to come to a diagnosis.

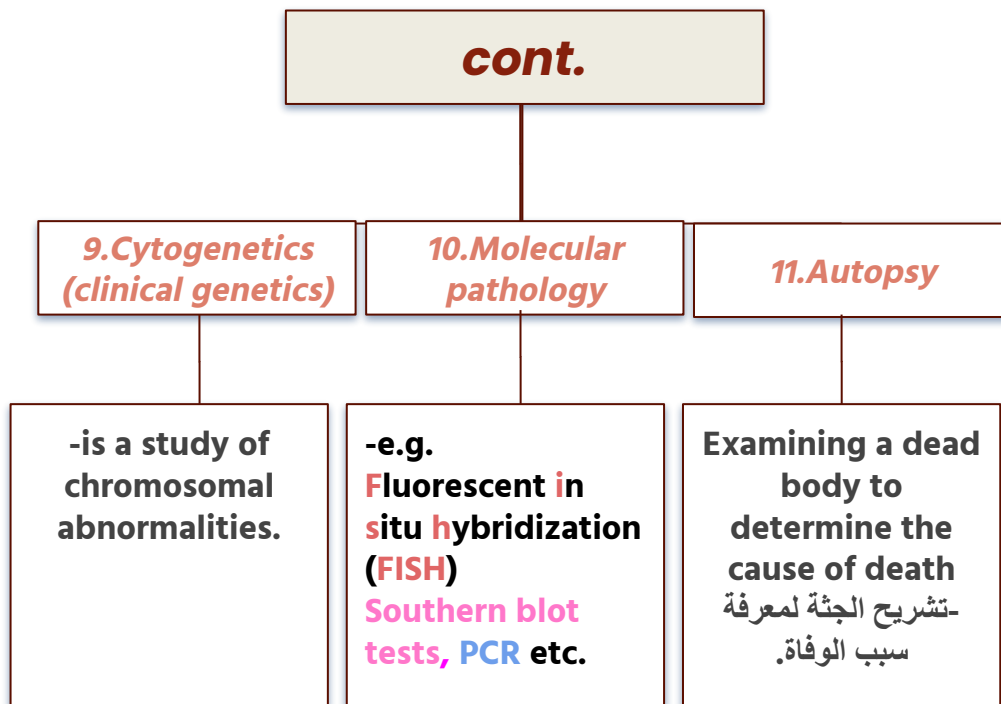
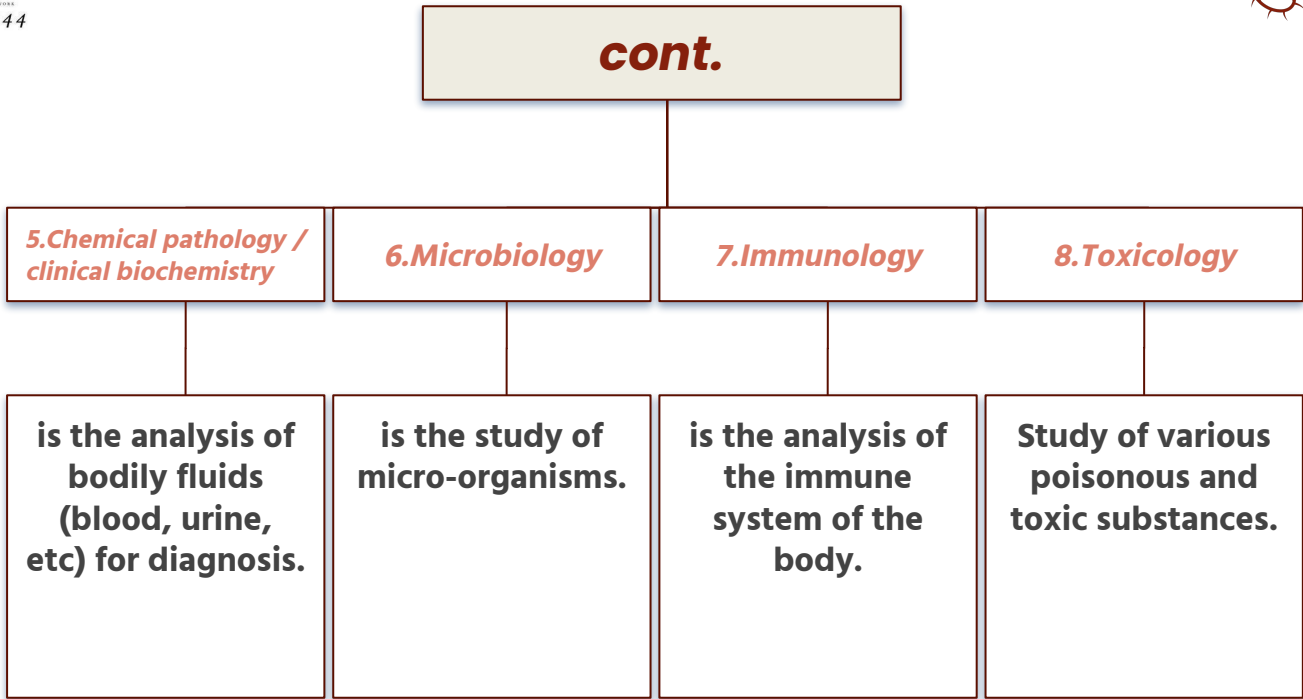
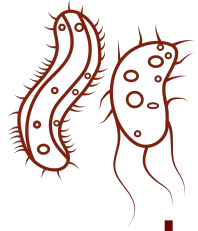
-The common pathological examinations are blood, urine and stool tests. Sometimes the patient is also asked to undergo a cytopathology or a histopathology test or other special pathological tests in order to obtain an accurate diagnosis.

-This way pathology plays an essential role in the diagnosis of a disease and management and treatment of patient.

The branches/subdivisions of pathology:

Branches of Pathology



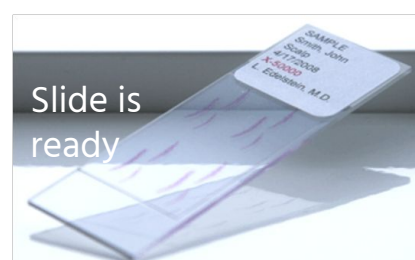


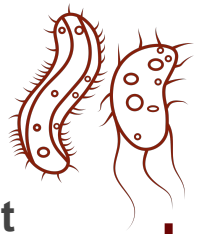
HISTOPATHOLOGY

- It is the study of tissues using light microscope. Tissues are obtained by doing biopsies and excision of organs by physicians & surgeons.
- Once the tissue is removed from the patient's body, it is immediately preserved (fixed) by putting it in a container of formalin (10% formaldehyde). **The purpose of fixation is to prevent autolysis and decomposition of the tissue.**
- Tissue is processed in a special multistep way and the end result is very thin slices of stained tissue (4-6 microns) glued on a slide.
- The most commonly used routine stain is **Hematoxylin & Eosin** stain. It gives the nucleus a blue/violet color & the cytoplasm a pink color.
- The pathologist will look at the slide under the microscope and give a diagnosis.
- It is usually the final / gold standard of diagnosis.
- **NOTE: sometimes during surgery an urgent diagnosis is needed INSTANTLY and tissue is processed rapidly to give results in 20 minutes.** ركزت على الاسم. This is called frozen section

Q: The final or gold standard of diagnosis?
A: Histopathology

Q: what is the process that gives results in 20 minutes?
A: frozen section





Histopathology slides ready to be examined under a light microscope

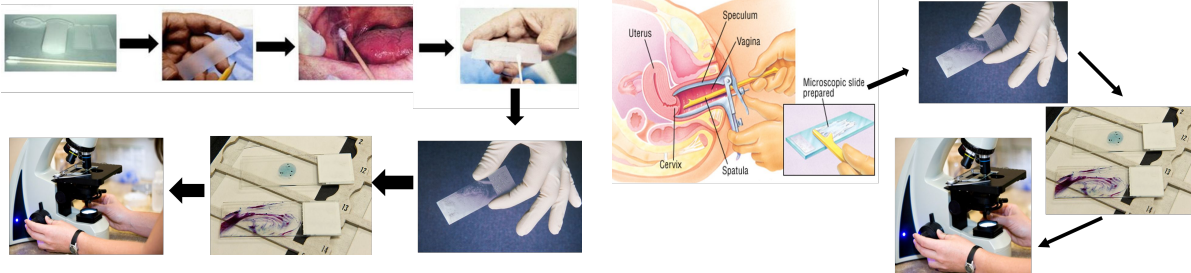


CYTOPATHOLOGY

Definition

Cytopathology is the study of morphology of cells which are obtained by scraping (exfoliative cytology) or aspiration (fine-needle aspiration cytology) from various parts of body.

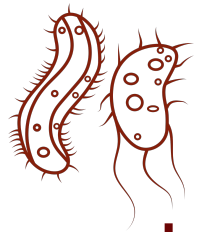
- Exfoliative (falling or scraping off) cytology:** The cells are scraped of any mucosa using a spatula (e.g. cervix and oral cavity) or the cells exfoliate (fall off) themselves and collect in the respective fluids/secretion (e.g. sputum and in urinary tract disease the cells which exfoliate collect in the urine etc.



NO BLOOD SEEN !!!

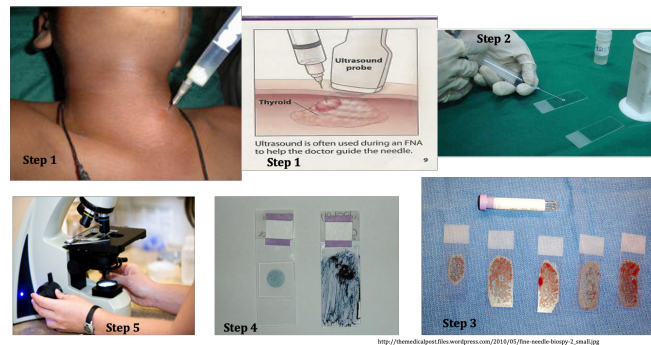
يمكن يجيك مريض ويقولك ما ابي اشوف دم فتستعمل الطريقة هذي بالفحص





cont.

- **Fine-needle aspiration cytology (FNAC):** In it the cells are obtained by **aspiration/suction** of cells from affected organ or tumor mass using a needle. The cells obtained are put on a slide, stained and examined under a microscope.

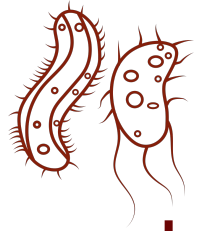


The morphology of the cells are studied and a diagnosis made from it. It is used for the purpose of:

- Screening for cancer e.g. cervical cytology is used in the screening of carcinoma of cervix.
- Diagnosing cancer

The advantage of cytologic techniques when compared to histopathological techniques is that the procedure is **cheap, takes **less time** and requires no anesthesia. **Faster and cheaper****

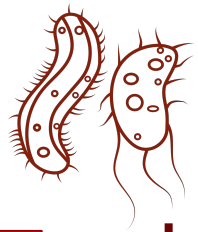




Autopsy

- **It is a sub-specialty of pathology which involves examining a dead body.**
- **An autopsy is done to**
 - > **To determine the cause of death (this is the main reason why autopsy is done). It can be performed in any of the following situations:**
 - Homicidal
 - Suicidal
 - Accidental
 - To identify the disease
 - > **To provide useful information about various disease.**
 - > **To do research.**
 - > **Also it can be used as a tool to educate students, surgeons etc**
- **Who does the autopsy? The pathologist.**





Some Instruments in Pathology:

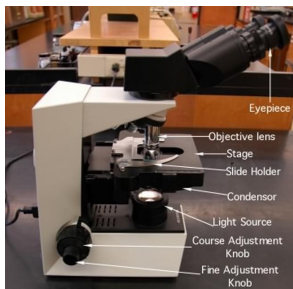
There are different diagnostic instruments used in pathology.

The Instruments

Light microscope

Immunofluorescence microscope

Electron microscope



Immunofluorescent (IF) microscope: IF microscope uses a special blue filter and antibodies tagged with fluorescent green dye to identify various antigens in various cells of the body. If antigen antibody reaction takes place the green dye lights up under the IF microscope and this way we know that the antigen is present in the cell. It is used in diagnosing immunological diseases.

Electron microscope: magnifies up to two million times, which is much higher than a light microscope. It enables us to see cell structure like mitochondria, endoplasmic reticulum, viral particles etc. It is also called as ultra structural studies. It is an expensive technique.

(IMPORTANT)





MCQs

1

Study of cell morphology, exfoliated or aspirated from body?

A. histopathology

B. cytopathology

C. hematology

2

What is the term for likely outcome of treatment?

A. prognosis

B. pathogenesis

C. diagnosis

3

A woman told the doctor she doesn't like seeing blood. What is the best mechanism to take a scrape?

A. Biopsy

B. FNAC

C. Exfoliative cytology

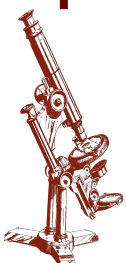
4

You have been asked to classify Parkinson's disease based on its pathogenesis. Under which of the following categories should you classify this disease?

A. degenerative

B. Metabolic

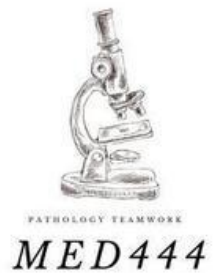
C. infective



1	2	3	4
B	A	C	A

Pathology Team

444



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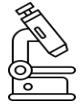
Norah Alnoshan



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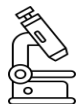
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Ibrahim Abdallah



Nisreen Alotaibi



Lubna Alamri



Ibrahim Al Bin Ali



Lana Alfouzan



Jana Alrumaihi



Fahad Albalawi



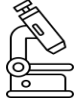
Seeta bin aqeel



Nora Albahily



Hmood Alsehali



Lujain Darraj



Ziyad BuKhari



Osama Alotaibi



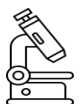
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