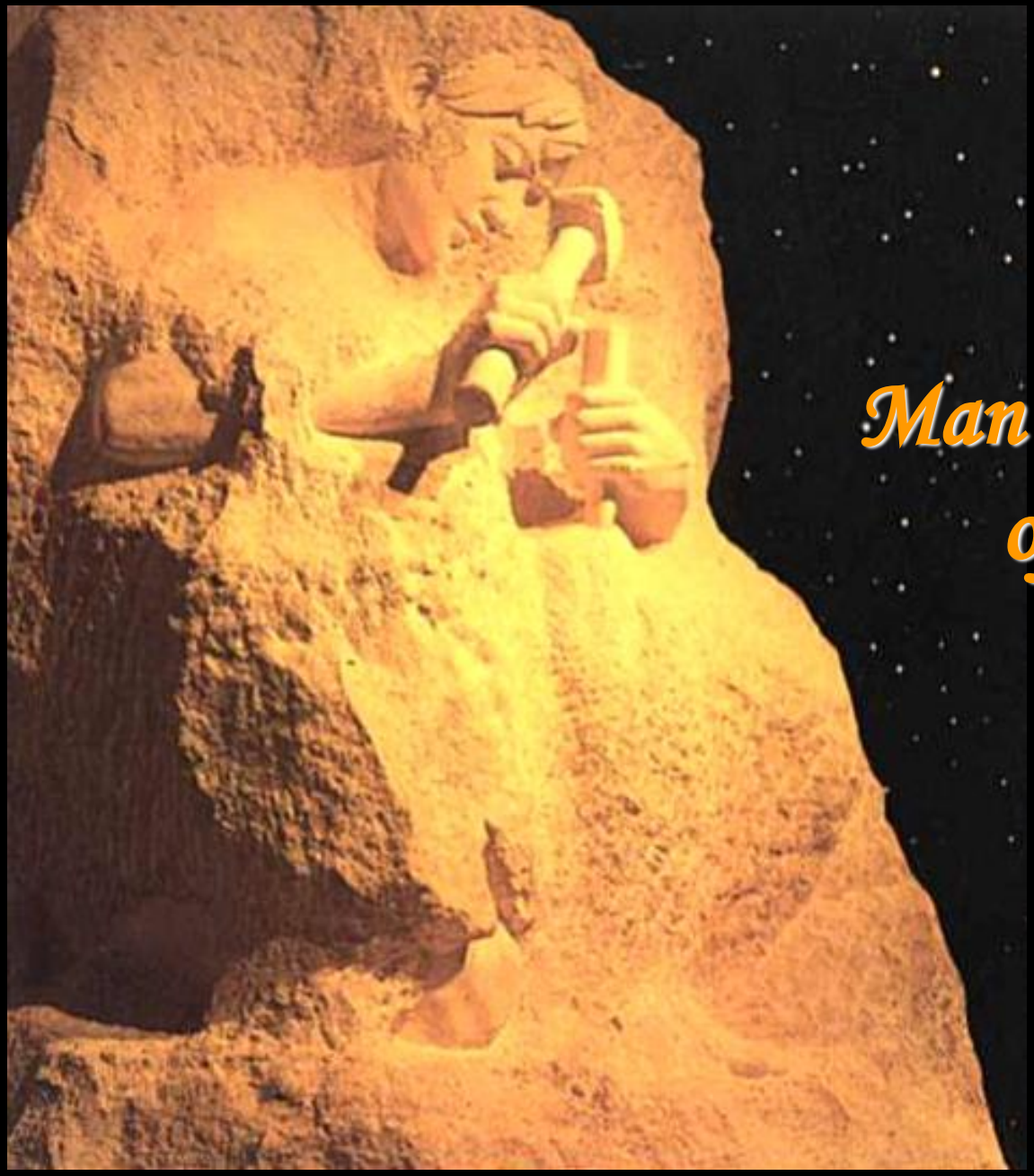
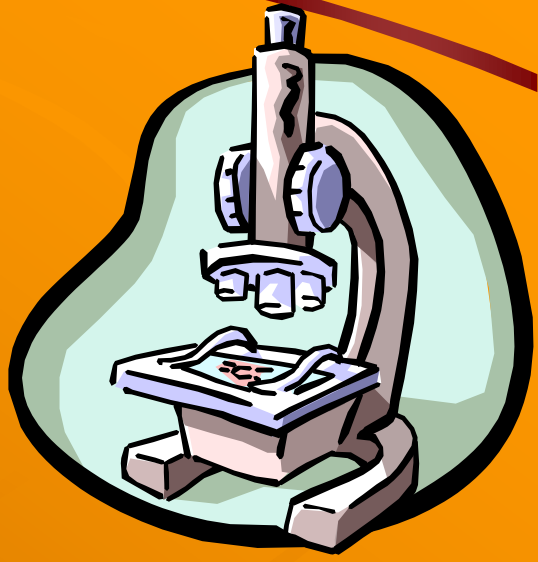


Man is the Architect of his life…

Pathology

An Introduction….



"Is the foundation of medical science and practice. Without pathology, the practice of medicine would be reduced to myths and folklore"

Introduction to Pathology

Pathology Literally it is the study of suffering
What happens to tissues/organs of the body in the presence of disease

Disease - Literally a "lack of ease"
Pathological process of the body organ(s) with its' own signs and symptoms
Dysfunction of significant number of cells in the organ must occur first

Pathology

The knowledge and understanding of pathology is essential for ***all would-doctors*** as well as ***general practitioners*** and ***specialists*** since unless they ***know the causes and mechanisms of disease*** and ***understand the language spoken by the pathologist*** in the form of laboratory reports, they would not be able to institute appropriate treatment or suggest preventive measures to the patient.

Importance of Pathology

- ✓ **Pathology services lie at the heart of health care services provided to patients and the community. They underpin the quality and cost effectiveness of health care.**
- ✓ **Pathology is a clinical knowledge service that is fundamental to modern medical practice and health care.**
- ✓ **Pathology is used in the diagnosis, treatment and management of an increasing range of clinical conditions.**
- ✓ **Pathology investigations are an integral part of the clinical consultation and procedural process with overseas studies indicating that 70-80 per cent of all health care decisions affecting diagnosis or treatment involve a pathology investigation1.**
- ✓ **Pathology is essential to the prevention, early detection, diagnosis and treatment of many of the leading causes of disease– e.g. cancer, cardiovascular disease and diabetes.**

Value of Pathology

- ✓ **Today, pathology testing services help in the early detection and prevention of disease, in timely clinical diagnosis and to monitor response to treatment at all stages of a person's life and in reducing many leading causes of disease burden in the community.**
- ✓ **As part of maternal-antenatal care, pathology testing helps to detect and prevent possible problems with health of the mother or baby - e.g. mothers may be tested for iron levels (anaemia) and have glucose testing (gestational diabetes) and the fetus may be tested for chromosomal abnormalities.**
- ✓ **Cancers - where pathology testing is an absolute requirement for diagnosis of new cases and is used to determine treatment options, predict prognosis, monitior disease progress and evaluate effectiveness of treatment.**
- ✓ **Young adults may be tested for diabetes and have genetic testing for particular disorders. Adults may be tested for cholesterol, diabetes, heart problems, thyroid conditions, liver disease and arthritis.**
- ✓ **Women have Pap smears for detection of cervical cancer and men have the PSA test for prostate cancer.**

Evolution of Pathology

In the past, .. people mistook magic for medicine…!

Now people mistake medicine for magic….!

From religious beliefs to rational approach(Antiquity to AD 1500)

- Era of gross pathology (AD 1500 to 1800)
- Era of technology development and cellularpathology (AD 1800 to 1950s)
- Modern pathology (1950s to dawn of 21 st century)

From religious beliefs to rational approach(Antiquity to AD 1500)

Hippocrates (Greece) 460-377 BC

Permanently dissociated medicine from religious mysticism.Started study of patient's symptoms as method of diagnosis.

Cornelius Celsus (Rome) 53 BC-7 AD

Described 4 cardinal signs of inflammation (redness, heat,swelling, pain)

Era of gross pathology (AD 1500 to 1800)

Giovanni B Morgagni(Italy) 1682-1771

- Introduced clinicopathologic correlation in the study of disease

- **John Hunter** (Scotland) 1728-1793
  Introduced pathology museum in the study of disease.

- **R.T.H. Laennec** (France) 1781-1826
  Described several lung diseases such as various tuberculous lesions of lungs, bronchiectasis. Described cirrhosis of liver (later called Laennec'scirrhosis). Invented stethoscope.

Era of technology development and cellularpathology (AD 1800 to 1950s)

Rudolf Virchow (Germany) 1821-1905

Father of cellular pathology. That introduced histopathology as a diagnostic branch by hiscellular theory

- **George N. Papanicolaou** (USA) 1883-1962

  Father of exfoliative cytologyDeveloped Pap smear for detection of cervical cancer in1930s

Modern pathology (1950s todawn of 21st century)

- **Watson and Crick** 1953
Described the structure of DNA
- **Nowell and Hagerford** 1960
Philadelphia chromosome in CML i.e. t(9;22)
- **Galland Pardue** 1969
In Situ Hybridization
- **Kary Mullis** 1983
Introduced polymerase chain reaction (PCR)

The History of the Pathology Department

The Department of Anatomical Pathology was founded by professor F.Agheicenko in 1945. He was the first head of the department. A that time the main research of the department was morphology of CNS tuberculosis, supporting also 5 doctors of medicine theses.

Professor D.Golovin (1918-1981) succeeded professor F.Agheicenko in 1954. He extended the research platform improving the instructive-educational process. He was concerned about the organization of work in the morgue, initiating also clinical-anatomical conferences. Scientific results were presented in three PhD theses in medicine and three monographs.

During 1958-1985 the department was headed by Academician V. Anestiade. It was a significant period for our university. With the foundation of new faculties (pediatrics, dentistry, preventive medicine), the training process was updated and restructured. Within the department new divisions were set up such as the Oncology Institute (Professor Iraida Iacovlev), Phtisiopneumonology Institute (Dr. I. Haidarlî) and the ICŞDOSMC (Professor I. Fuior (1944-2008)). The Pathology Department has become a methodical- scientific republican centre.

The scientific direction proposed by Academician V. Anestiadi, concerns cardiovascular pathology. During this period 3 members of the Department became doctors habilitate, 18 doctoral students successful defended their theses and got the PhD degreeand 5 monographs were published under the guidance of Academician V. Anestiade. In 1977 Academician V. Anestiade and his disciples Ie Zota and S. Rusu were awarded the State Prize of the RM.

From 1986 to 1987, the department was headed by associate Professor A. Banaru (1937-1987). He was a talented teacher and organizer, who implemented modern methods of training and certification of students.

During 1987-2012 the Department was headed by professor Ie. Zota corresponding member of Academy of Science of Moldova. The scientific researches continued with atherosclerosis patomorphogenesis. In this period of time one habilitate thesis and 5 PhD theses in medicine were made.

Teaching: As the only Pathology Department at University that is both a basic science and a clinical department, the teaching mission is complex and serves an extremely diverse spectrum of learners, including but not limited to medical students, dental students, clinical residents and fellows, postdoctoral research fellows, predoctoral students in the Graduate Program in Pathology and other graduate programs, and a variety of undergraduate students in multiple Health Affairs and Academic Affairs courses and programs. The teaching mission also includes very active participation in continuing medical education at the local, regional, national and international levels.

Classification of Diseases:

- **Developmental** – genetic, congenital.
- **Acquired:**

***Inflammatory** – Trauma, infections, immune, etc.

***Neoplastic** – tumors cancers

***Degenerative** – ageing.

***Metabolic**.

***Iatrogenic: Drug induced**.

Branches of Pathology

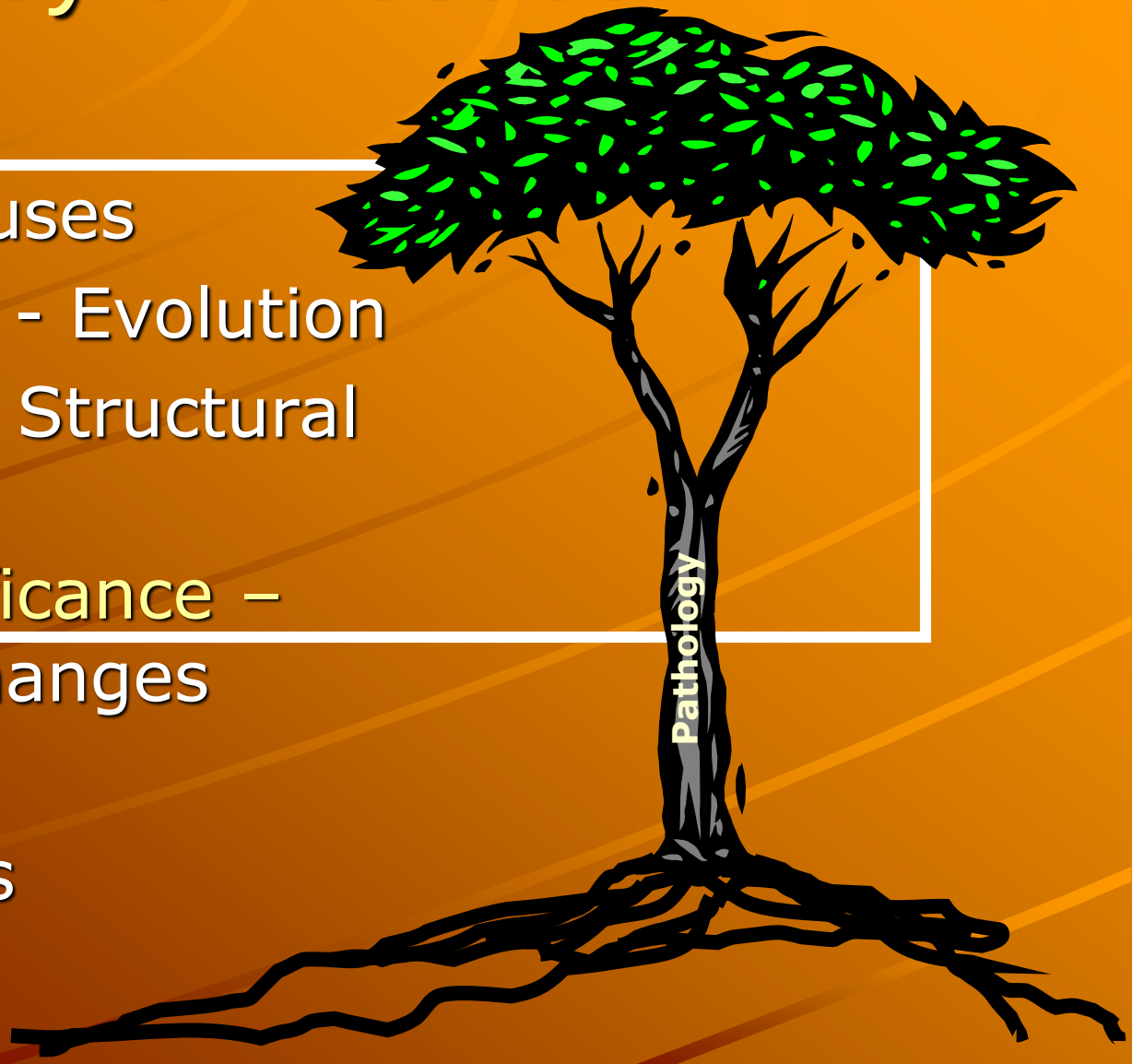
- General Pathology
- Systemic Pathology
- Gross Pathology
- Cellular Pathology
- Surgical Pathology
- Clinical Pathology
- Immunopathology

Learning Pathology:

- **General Pathology**
  - Common changes in all tissues. e.g.. Inflammation, cancer, ageing, edema, hemorrhage ….etc.
- **Systemic Pathology**
  - Discussing the pathologic mechanisms in relation to various organ systems e.g. CVS, CNS, GIT…..etc.

Study of Disease:

- Epidemiology
- Etiology - Causes
- Pathogenesis - Evolution
- Morphology - Structural Changes
- Clinical Significance – Functional Changes
- Management
- Complications
- Prevention



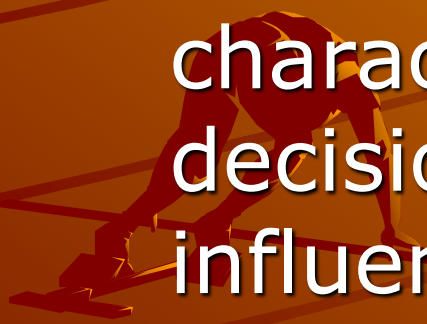
Pathological Diagnosis

- Before treatment must have a pathology report
- Need actual confirmation of pathological diagnosis from a ***cell sample.***

- What is the process that leads to this point? Think about when you visit a Dr.

Why is it Important to Get Pathology?

- All tumors are not the same!
- The pathology report gives specific information regarding the cells characteristics that allow treatment decisions to be made as well as influence the outcome
- The outcome of tissue recovery is documentation of a specific type of cancer

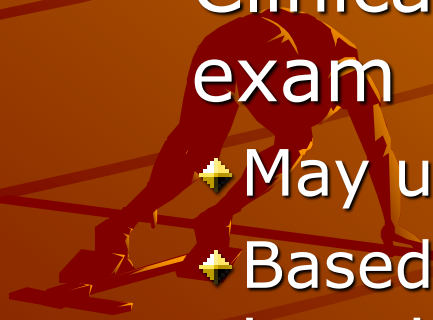


What is the pathologist looking at?

- Disturbances of normal tissue
- Non uniformity in cell shape, size, and nuclear configuration
- Flow cytometer uses a laser to scan cells and help in the diagnosis.
  - These detectors analyze individual cells for size, DNA content, surface markers, cell-cycle position and viability

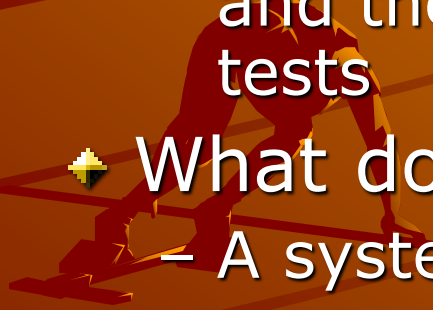
From Pathology, we get…

- Grading and staging
- Staging may be Clinical, Pathologic or a combination
  - –Clinical staging is based on physical exam
    - May use imaging studies
    - Based on recognition of tumor size, invasiveness and local or distant mets
    - May be verified and converted to pathologic stage by anal sizing tissue samples



Diagnosis

- What is "Diagnosis"?
  - The formal name(s) used to describe a patient's disease
  - The process of identifying a disease based on the patient's symptoms, the doctor's findings, and the results of investigations and laboratory tests
- What do you need to make a diagnosis?
  - A system of classification that supplies the necessary names, definitions, and criteria
  - The means to ascertain the defining characteristics of a disease in the individual patient

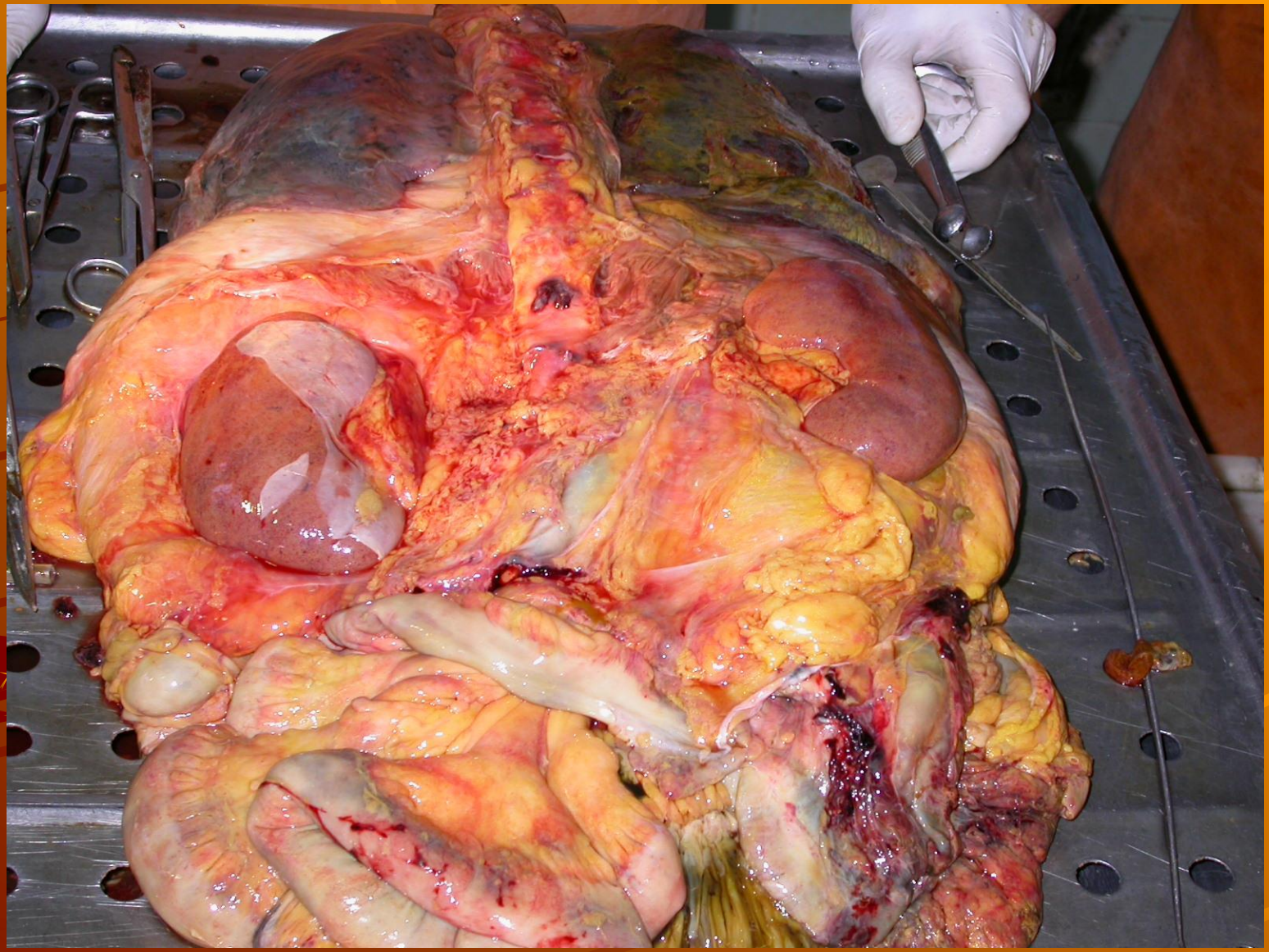


Methods of the study in Pathology

- Autopsy
- Biopsy
- Cytology

- **Necropsy:** Gross examination of the animal cadaver by systematic dissection in order to evaluate any abnormal changes **(lesions)** that may be present.
- **Autopsy:** Synonymous to necropsy in human medicine
- **Autopsy means "see for yourself". It is a special surgical operation, performed by specially-trained physicians,on a dead body. Its purpose is to learn the truth aboutthe person's health during life, and how theperson really died.**
- **Biopsy:** Removal and examination of tissue obtained from the living body

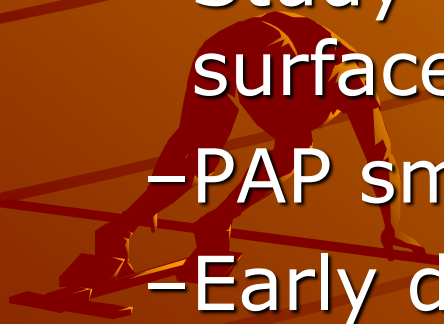
Autoposy




CM
1
2
3
4
5

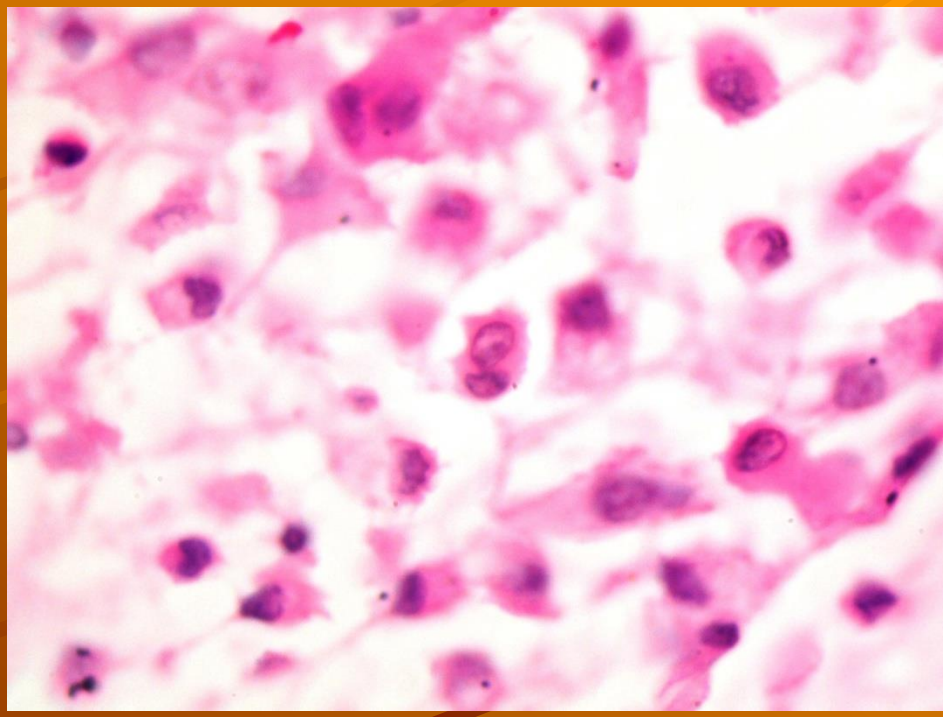
Obtaining Tissue Samples

1. Exfoliative Cytology
   - –Recovery of exfoliating cells
   - –Least invasive method
   - –Study of single cells from various surfaces or secretions shed by the tumor
   - –PAP smear-
   - –Early detection of cervical and uterine ca.



What is Cytology?

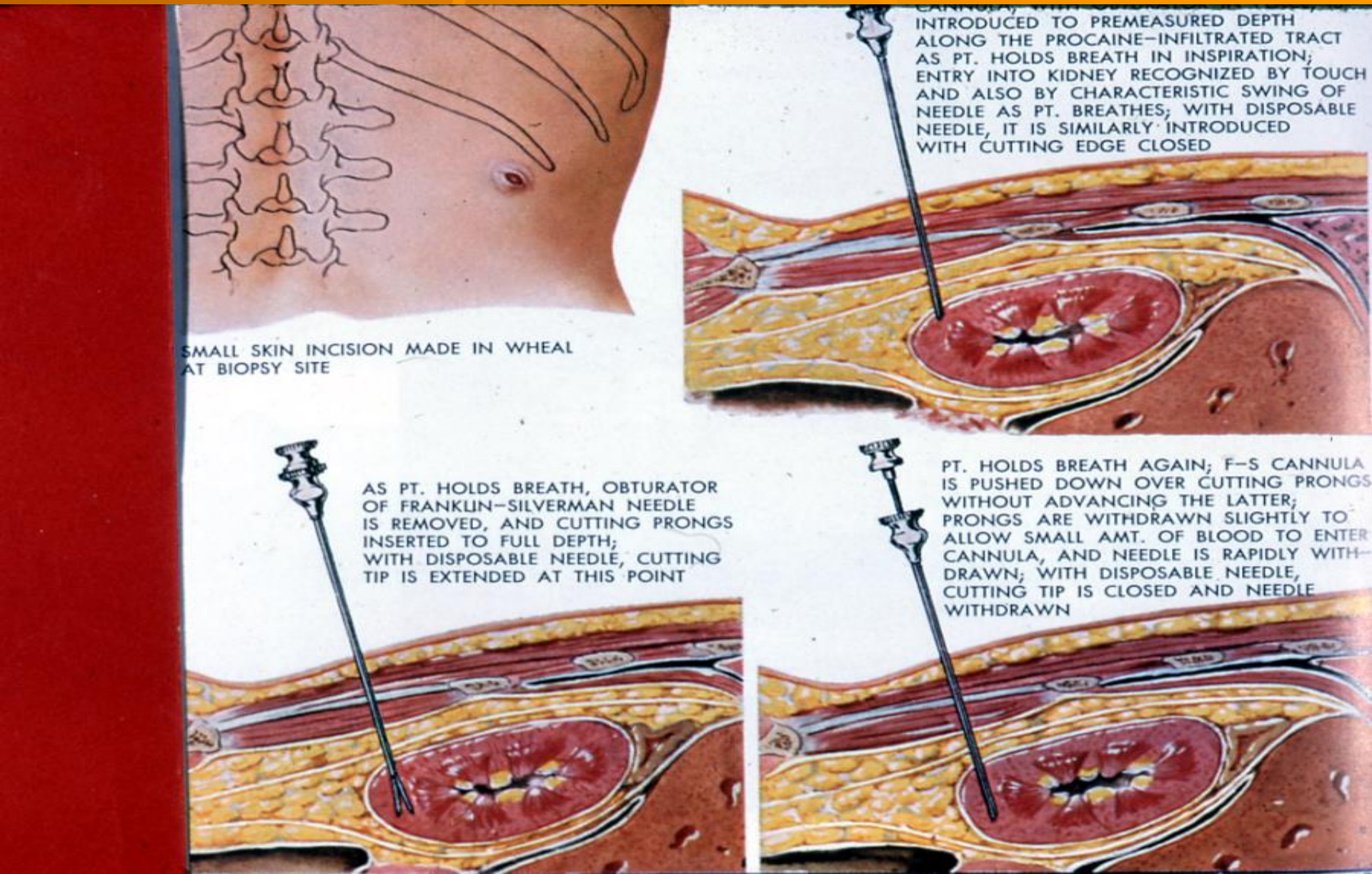
Cytology can also refer to *cytopathology*, which analyzes cellstructure to diagnose disease



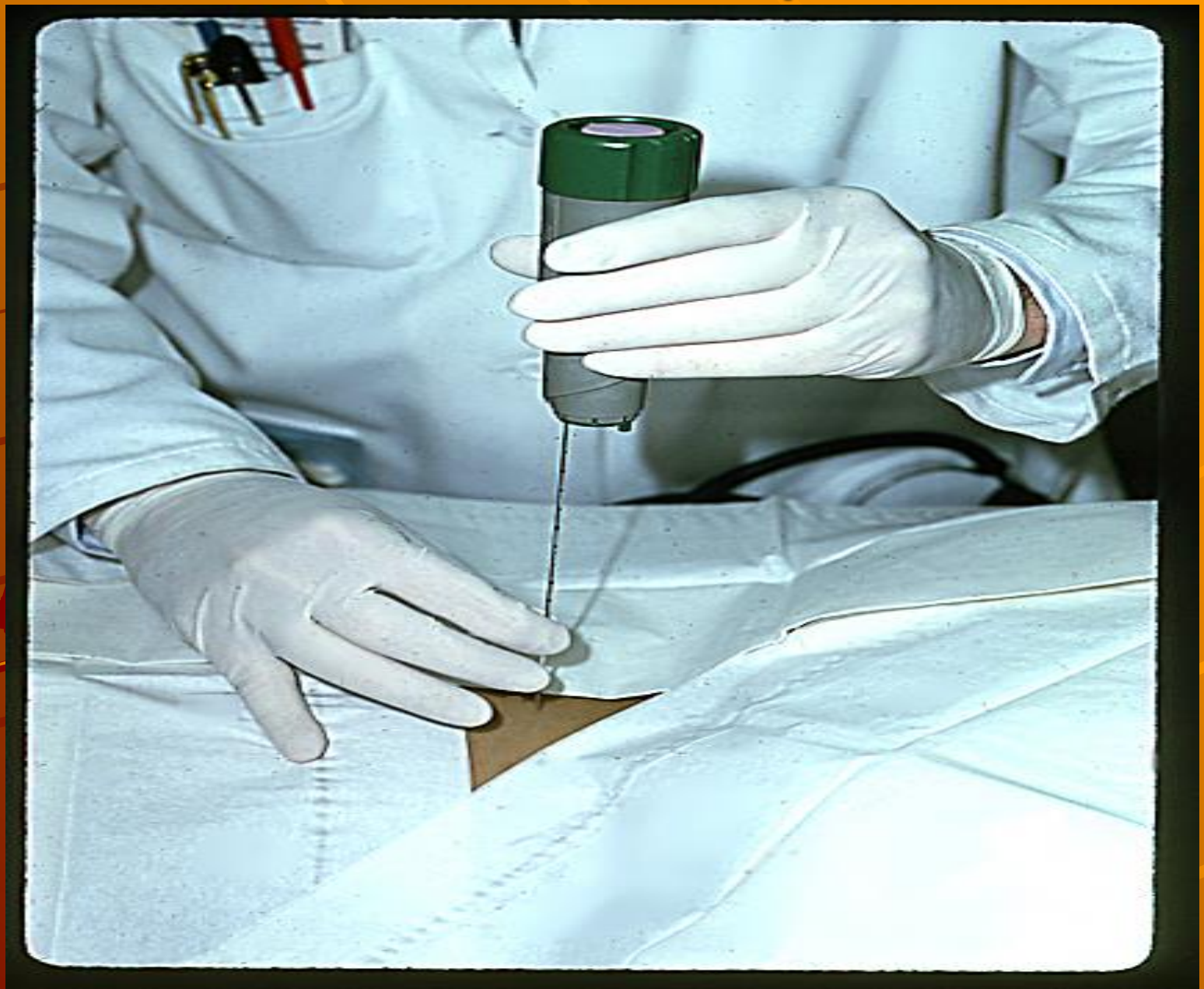
Obtaining Tissue Samples

2. Fine Needle Aspiration
   - More invasive than exfoliative cytology
   - Acquire single cells
   - A small core needle is inserted directly into the tumor
   - Used to get sample from remote and relatively inaccessible tumors
   - Pancreas, breast lump

Fine needle aspiration



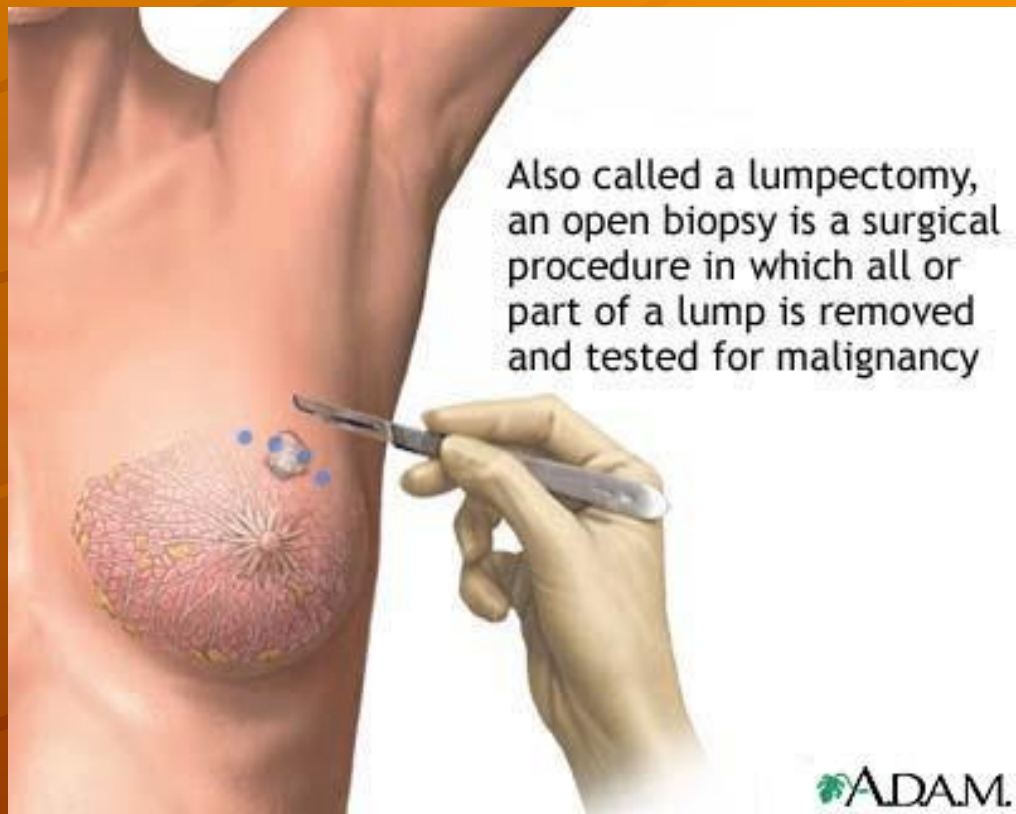
Fine needle aspiration



FNA by USG guidance

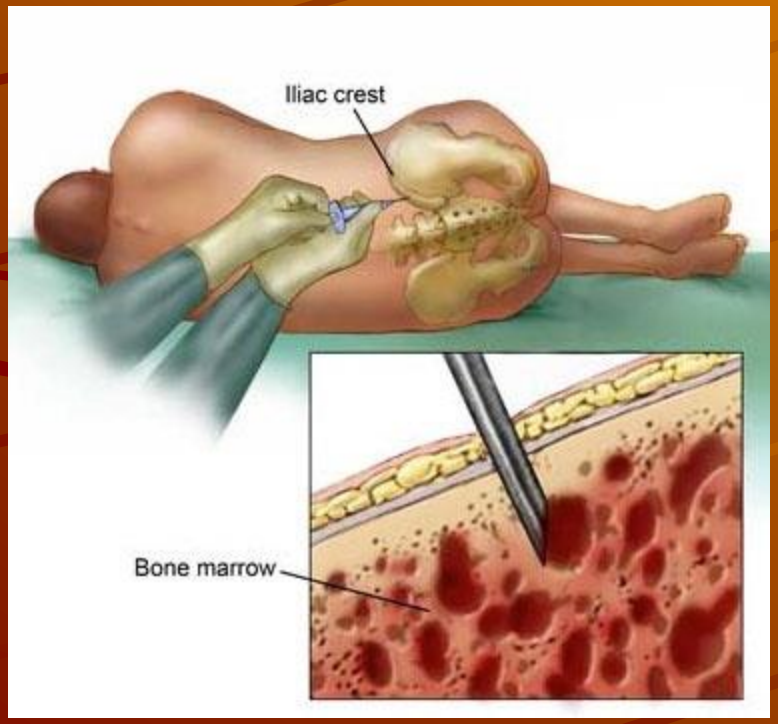
Obtaining Tissue Samples

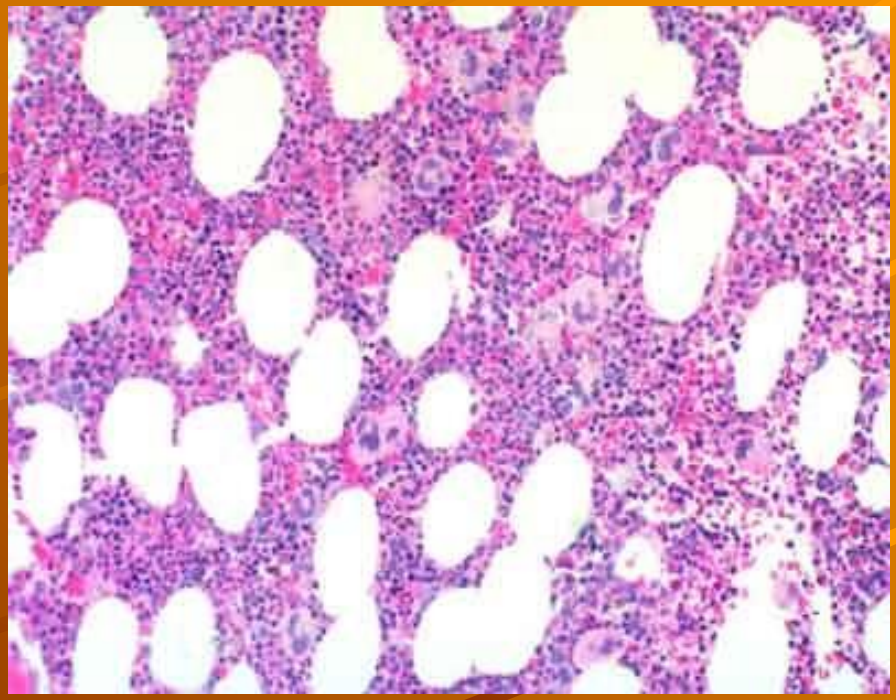
3. Open biopsy
   - Most invasive
   - Direct vision
   - Tumor is surgically removed either totally or partially



What is Bioposy?

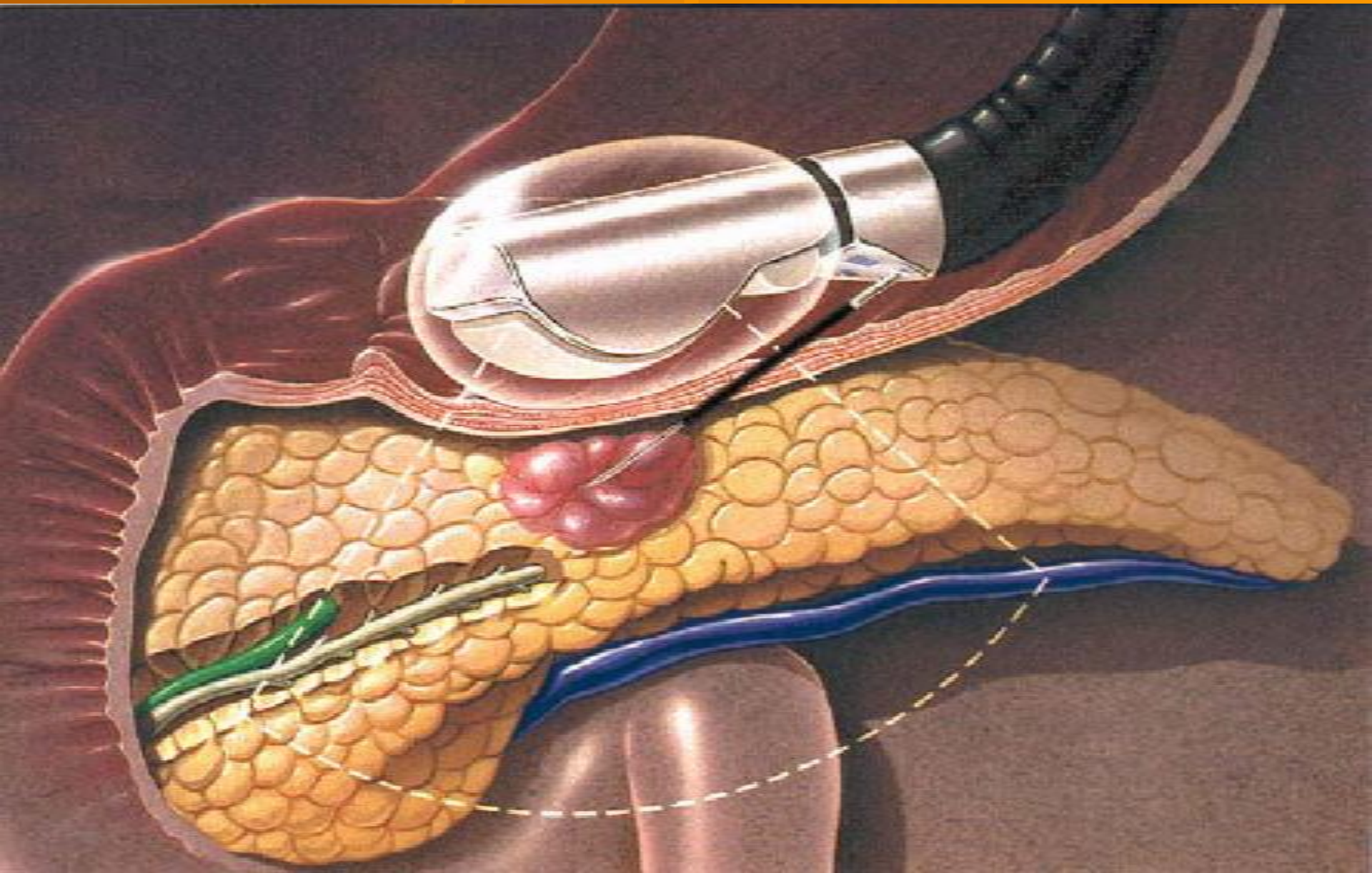
A biopsy is the removal of a sample of tissue from the body for examination. The tissue will be examined under a microscope to assist in diagnosis. Therefore, only very small samples are needed.





Laparoscopic biopsy

Endoscopic biopsy



Pathology focuses on 4 aspects of disease:

- ***ETIOLOGY:*** **Cause of disease.**
- ***PATHOGENESIS:***

  Mechanisms of development of disease.
- ***MORPHOLOGY:***

The structural alterations induced in cell and tissues.

- ***FUNCTIONAL CONSEQUENCES:***

  Functional results of the morphologic changes, as observed clinically.

Etiology

"Study of the cause of a disease"

Knowledge of *etiology* remains the backbone of:

- **Disease *diagnosis***
- **Understanding *the nature of diseases***
- ***Treatment* of diseases.**

Etiology

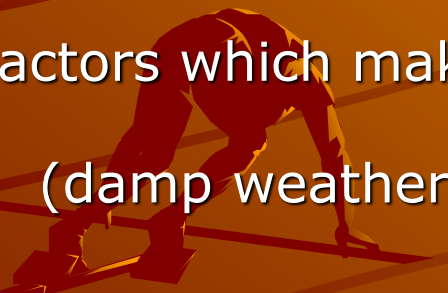
"Study of the cause of a disease"

- ***An etiologic agent :***

is the factor (bacterium, virus, etc.) responsible for lesions or a disease state.

- ***Predisposing Causes of Disease:***

Factors which make an individual more susceptible to a disease (damp weather, poor ventilation, etc.)



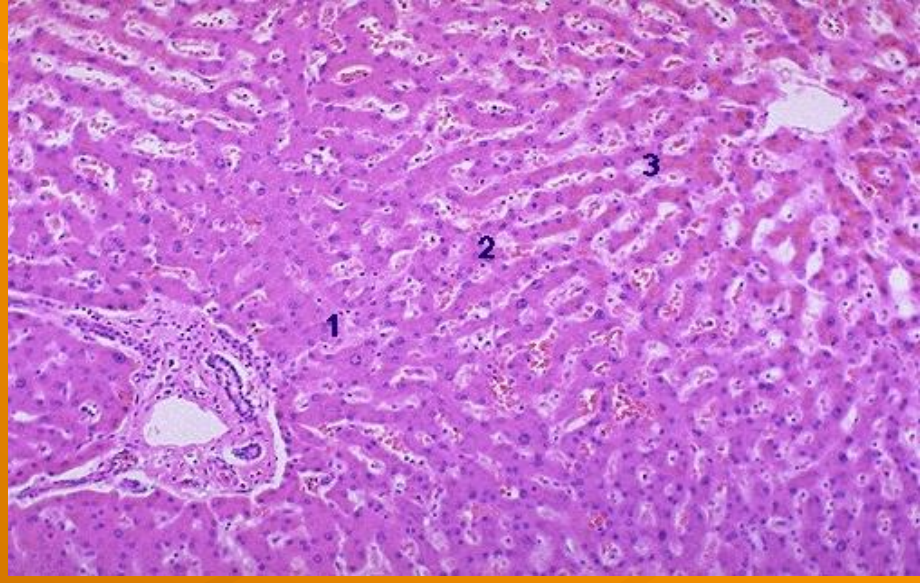
- ***Exciting Causes of Disease:***

Factors which are directly responsible for a disease (hypoxia, chemical agents…. etc.).

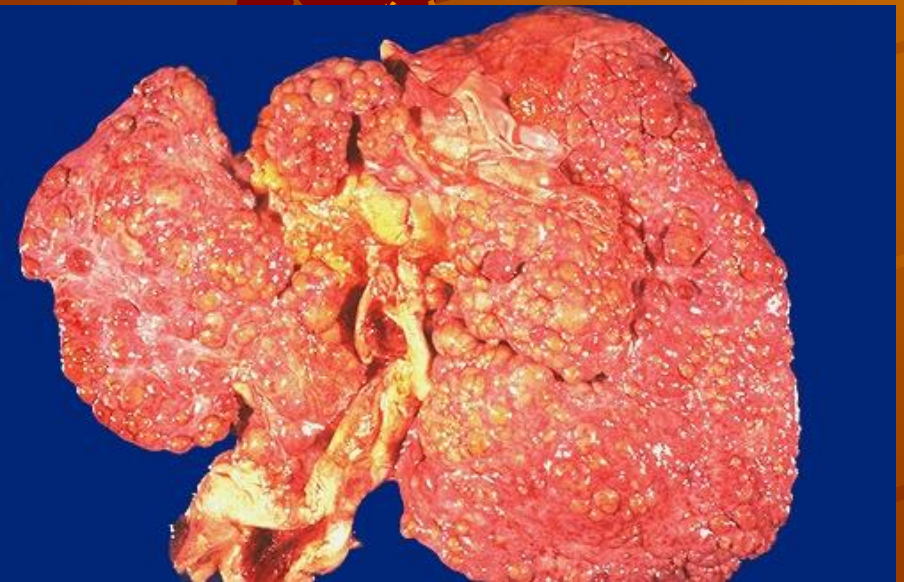
pathogenesis

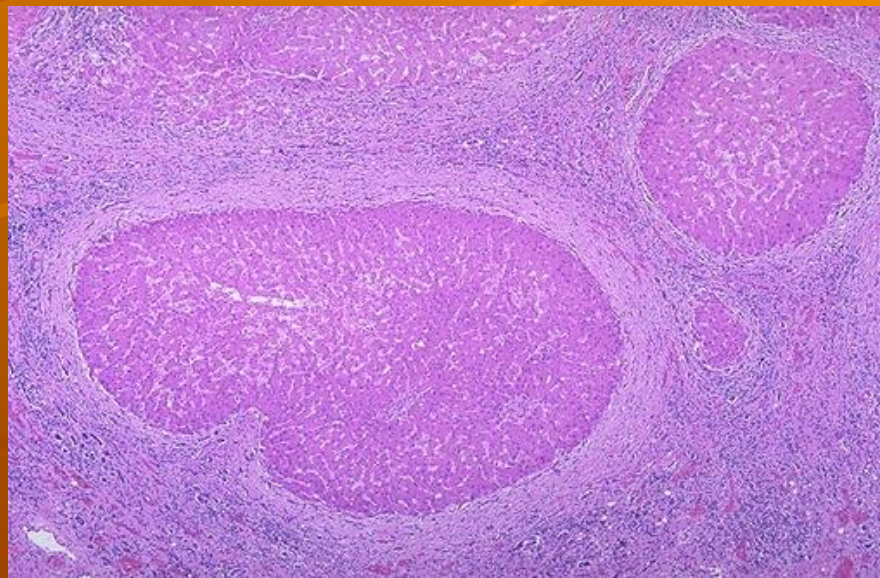
The sequence events in the response of the cells or tissues to the etiologic agent, from the initial stimulus to the ultimate expression of the disease,"from the time it is initiated to its final conclusion in recovery or death"

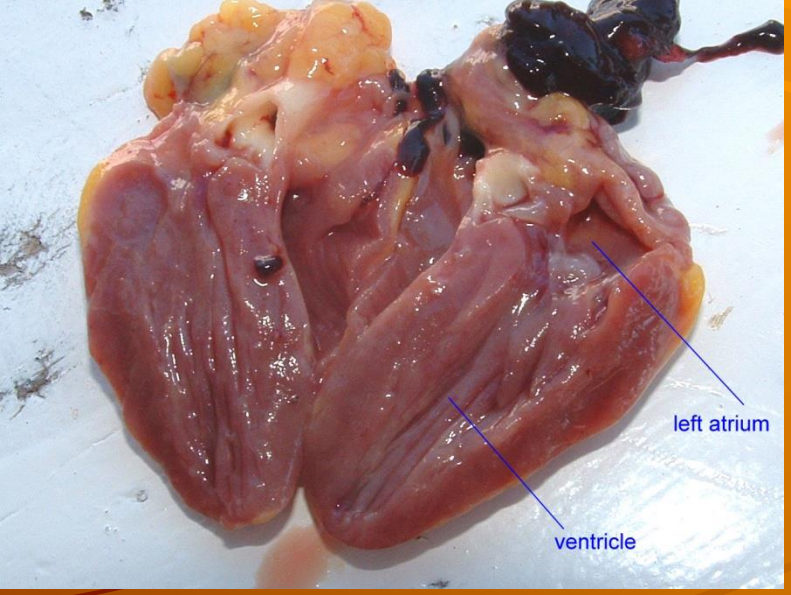
The core of the science of pathology — the study the pathogenesis of the disease.

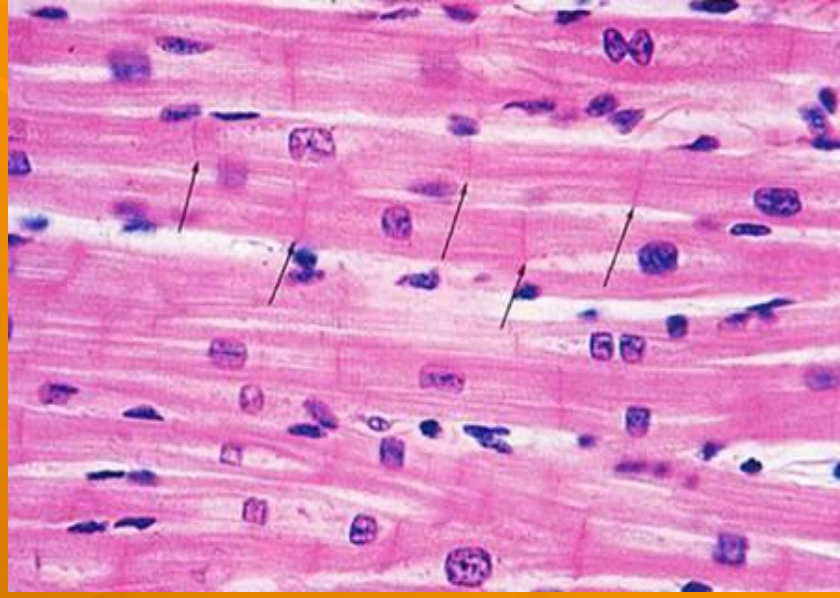


Morphology - Structural changes in disease

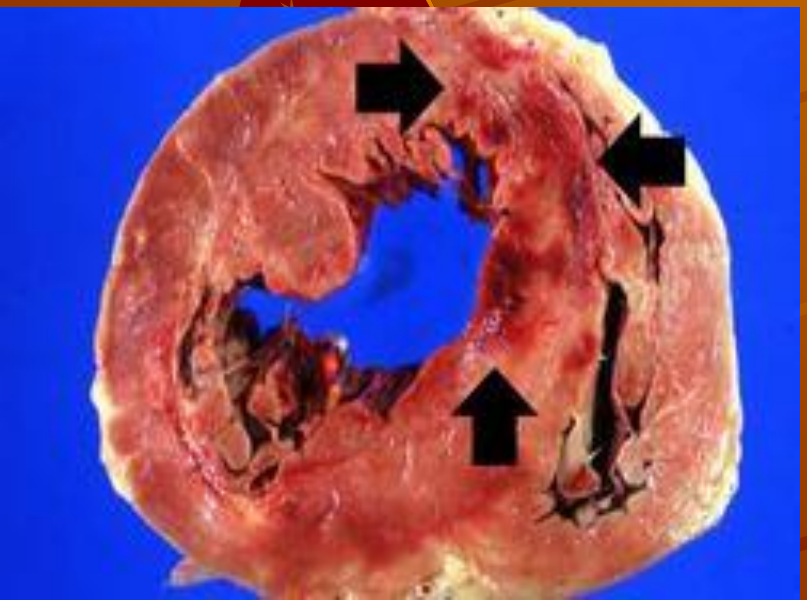


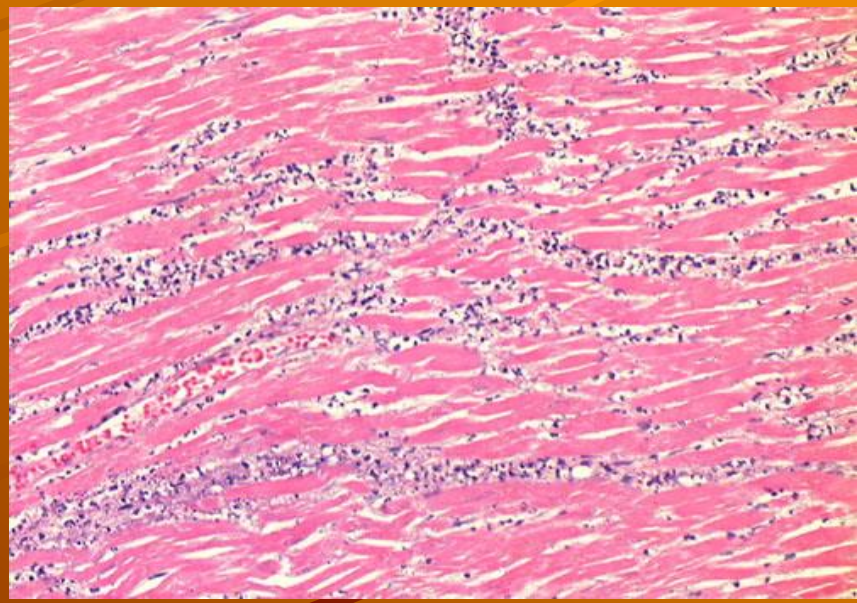






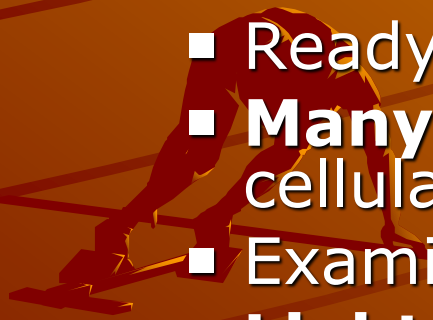
Morphology - Structural changes in disease



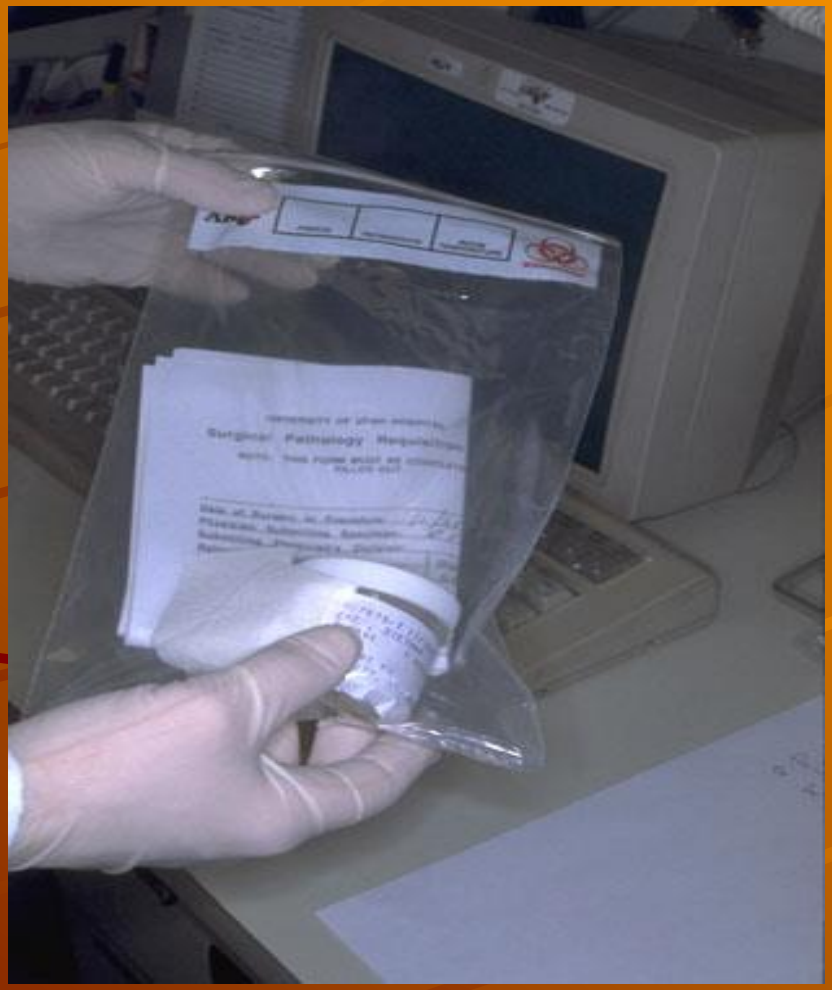


Preparing the Tissue Sample

- Fix the tissue
- Immersed in a solution of **formalin**
- Solid tissue placed in hot liquid **wax**
- Cut into thin slices by a **microtome**
- Placed on glass slides
- Wax is removed
- Ready for examination
- **Many stains** can be used to examine various cellular features
- Examined using a **light microscope**
- **Light microscopes can magnify objects up to 1,000 times, revealing microscopic details.**



Collected material



biopsy material

marking the incision line

Processing of the material

Inclusion in paraffin

Cutting a frozen section.

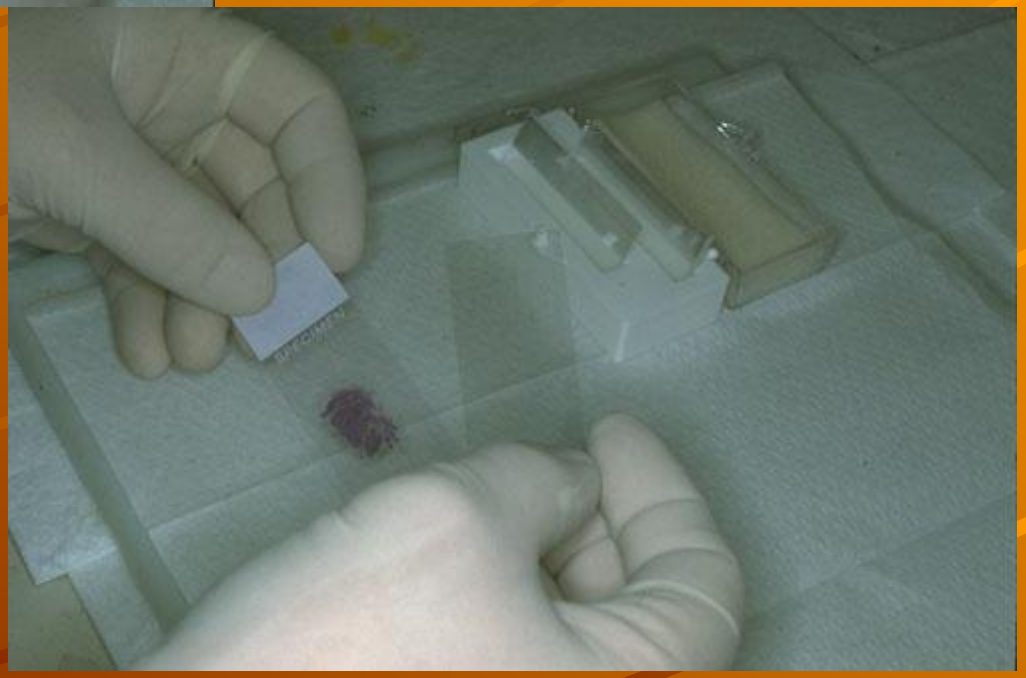

OIL

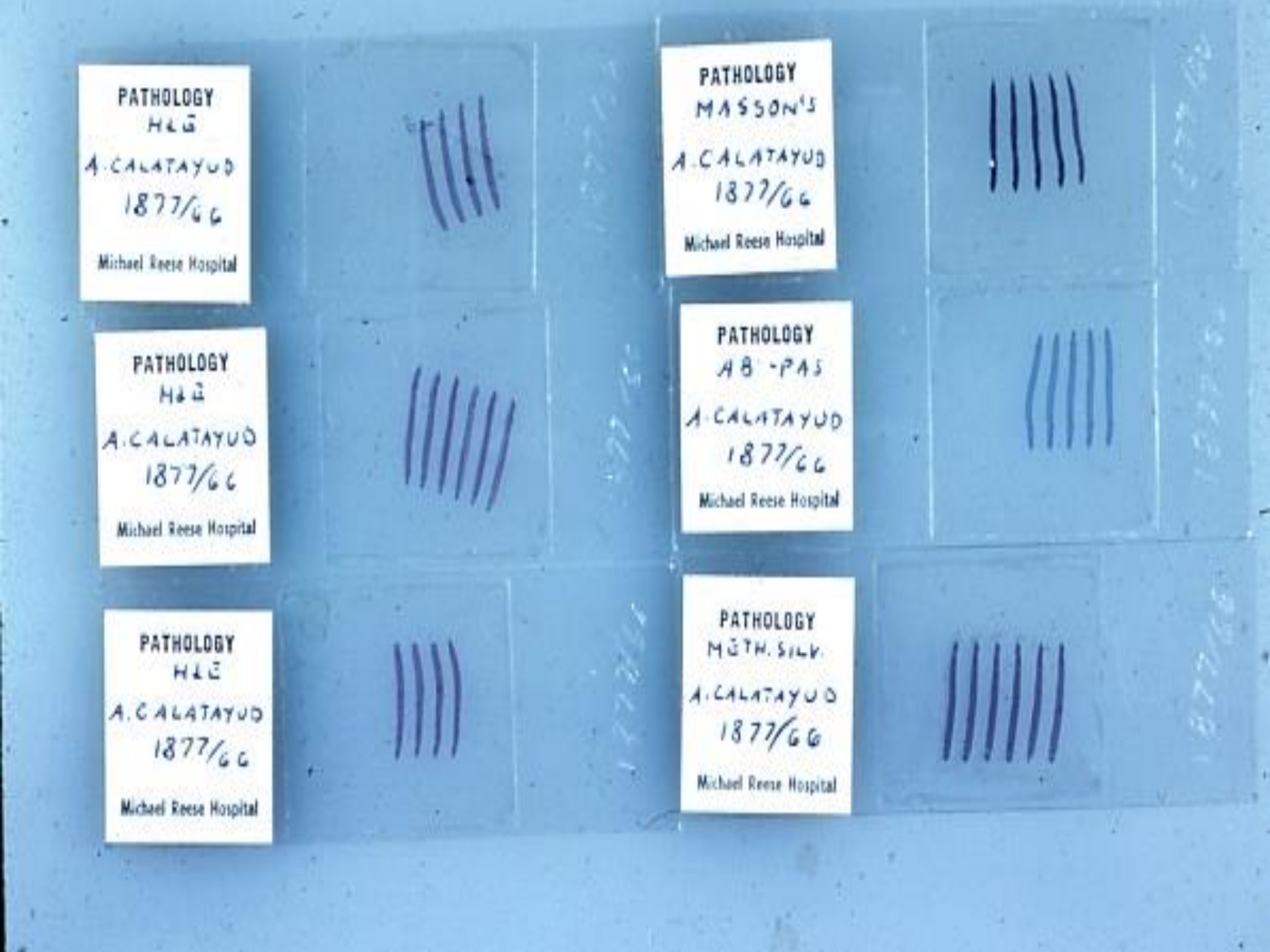

SPECIMEN


DISTILLED WATER

Staining

Coverage

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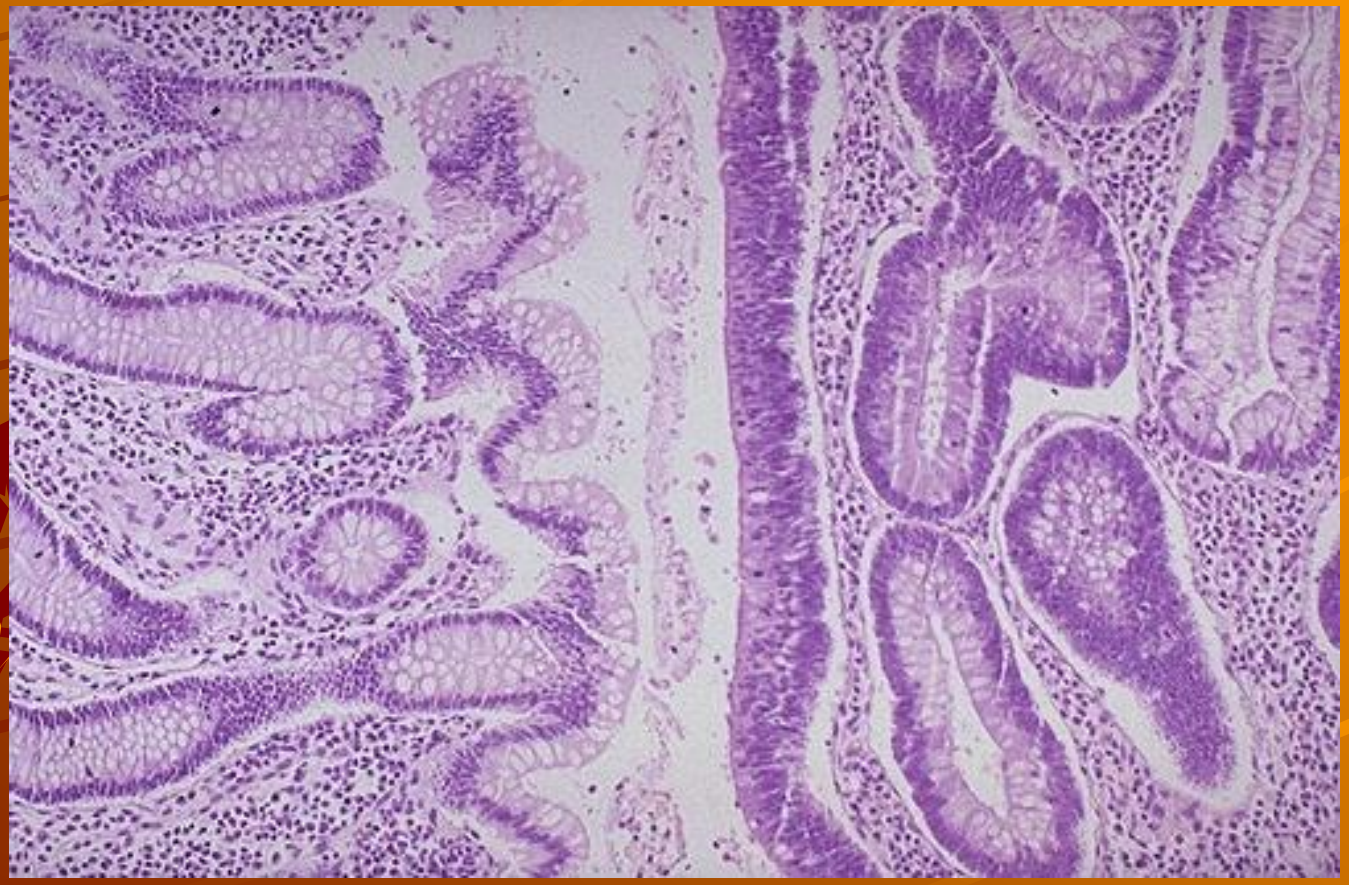
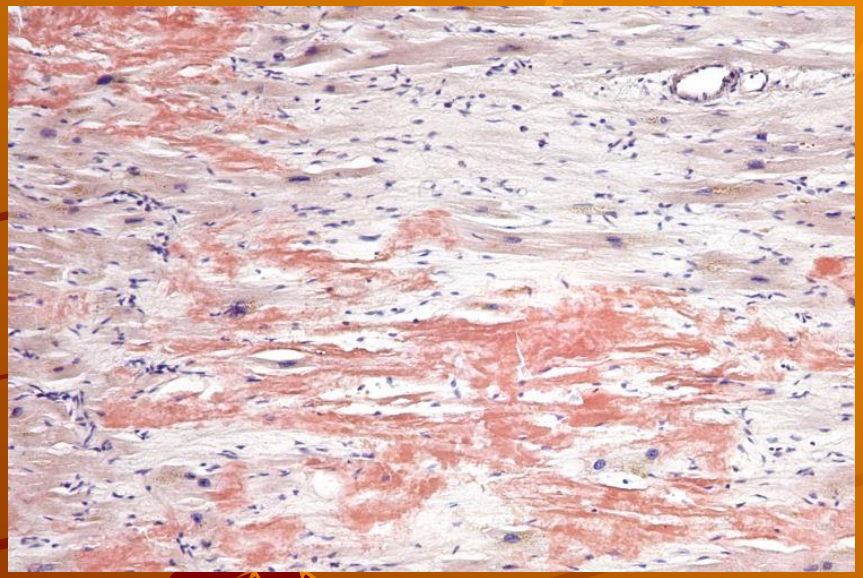
Ocular lens (eyepiece)
Head
Body tube
Nosepiece
Arm
Objectives
Fine focus
Stage
Mechanical Stage control knobs
Diaphragm control lever
Coarse focus
Light source
Switch
Base

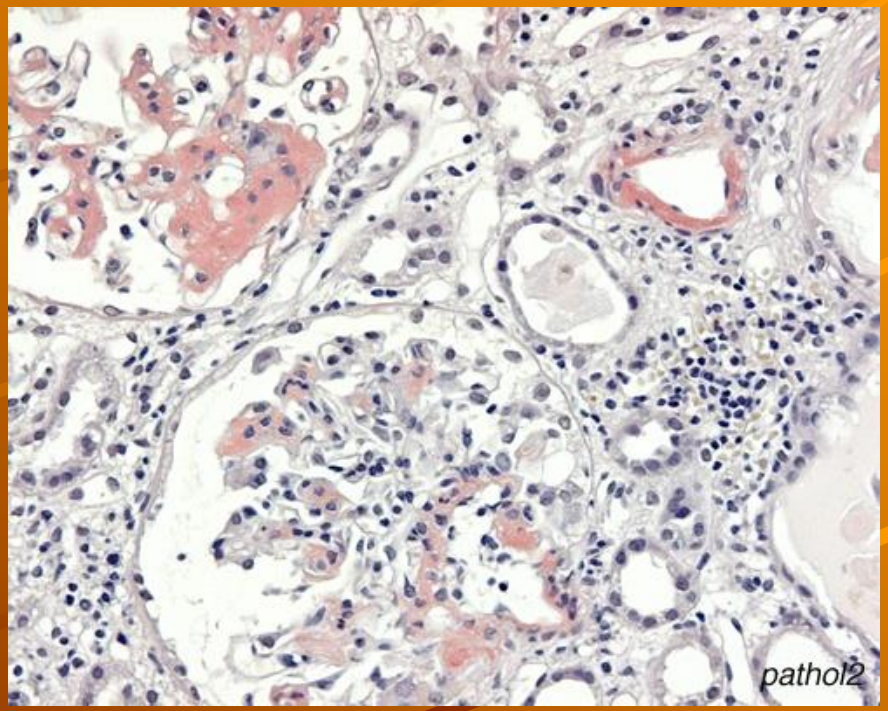
Hematoxylin and eosin



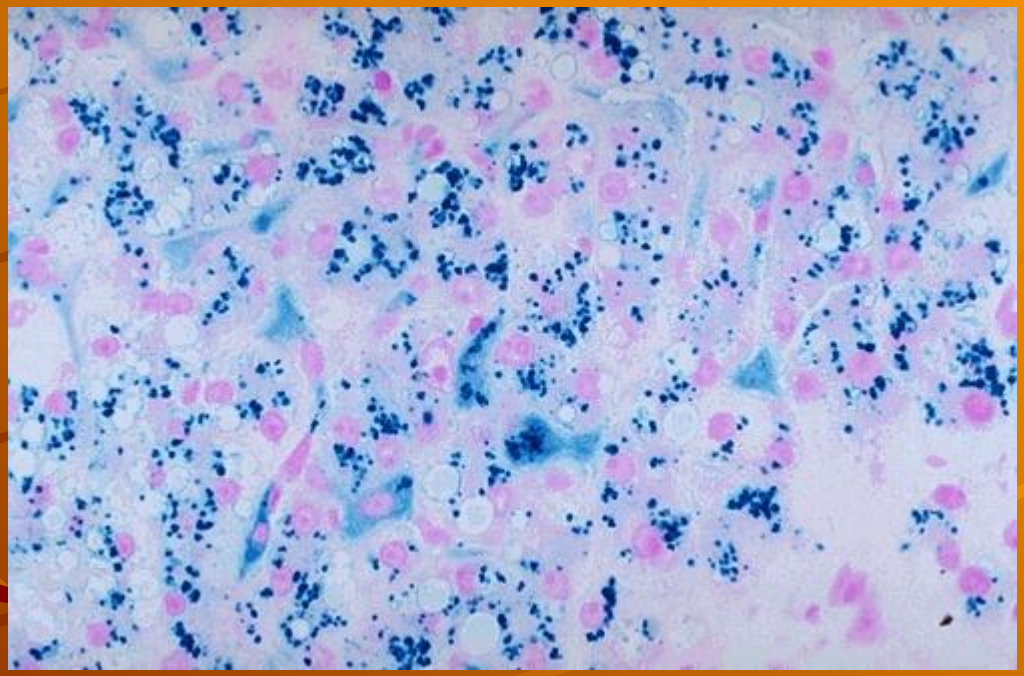
Congo red stain



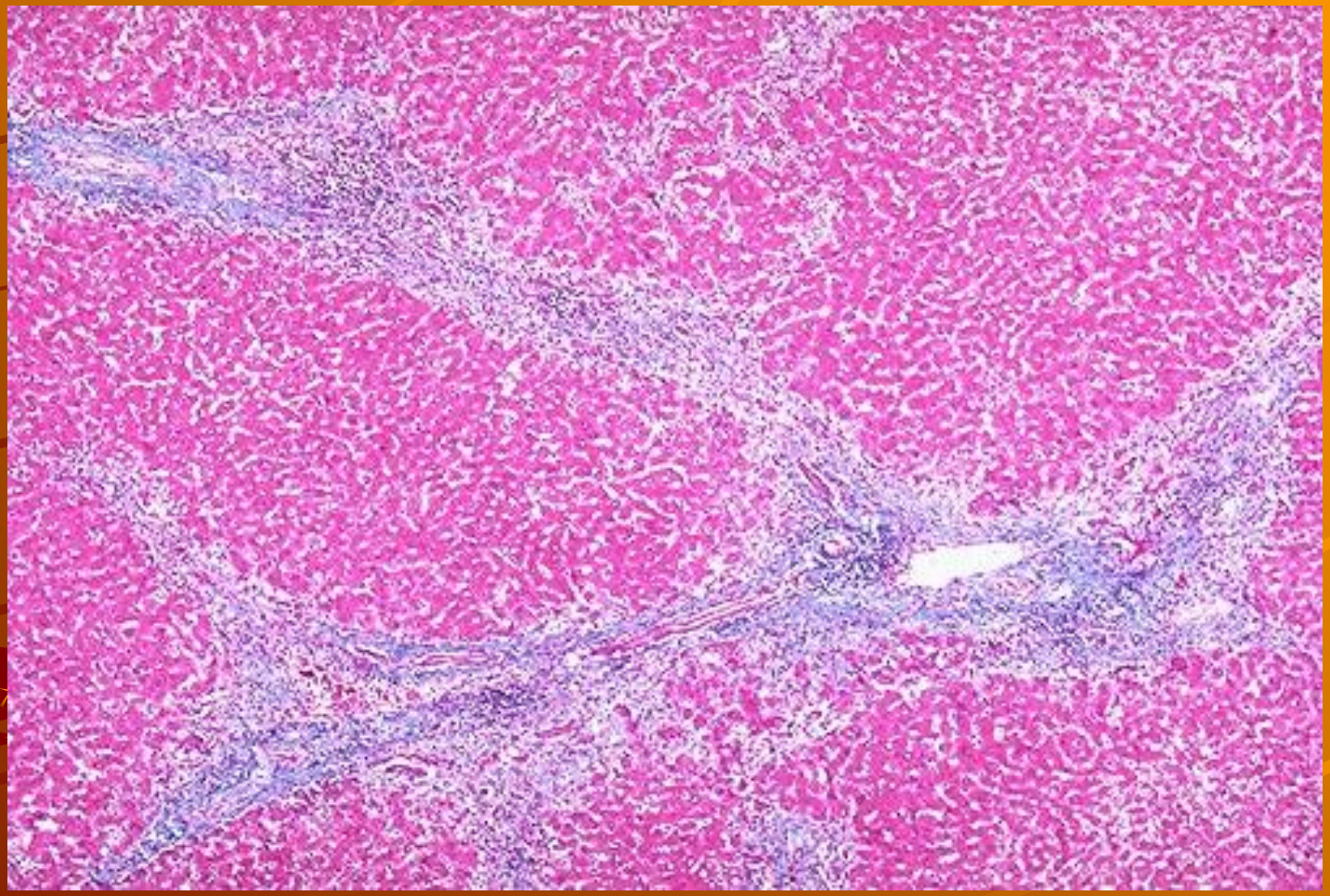
amyloidosis



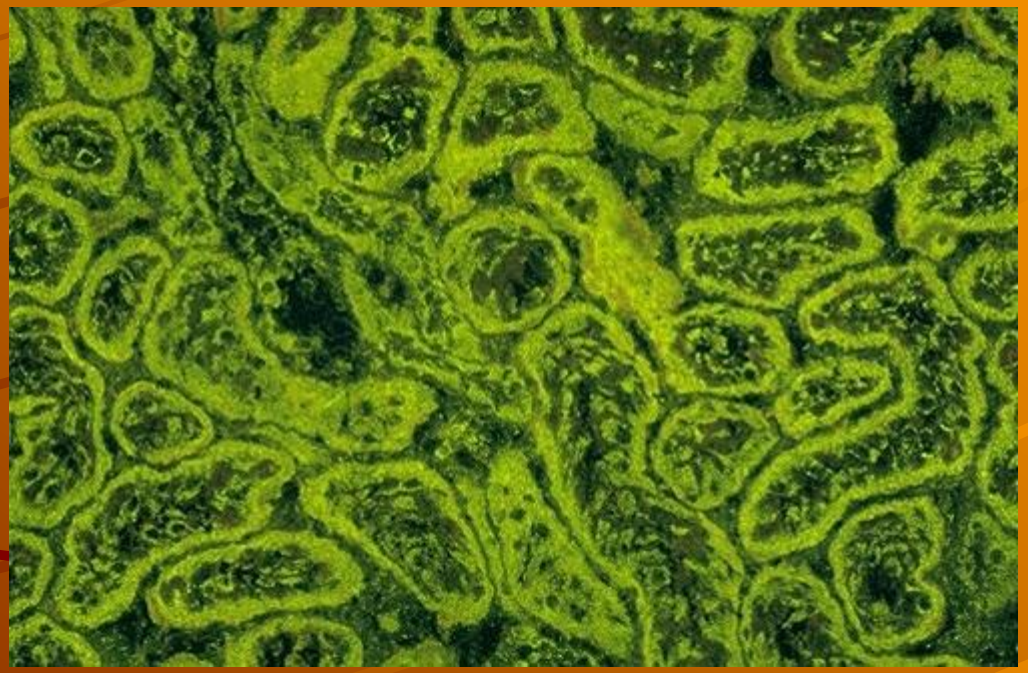
Prussian Blue



Trichrom stain

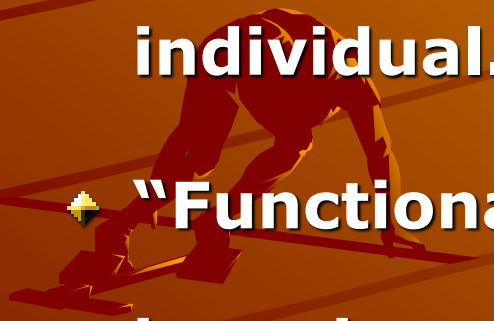


Immunofluorescence



Clinical Symptoms & Signs

- **Clinical symptoms are the patient's complain usually by its own words.**
  - **Clinical signs are seen only in the living individual.**
  - **"Functional evidence of disease which can be determined objectively or by the observer" (fever, tenderness, increased respiratory rate, etc.)"**

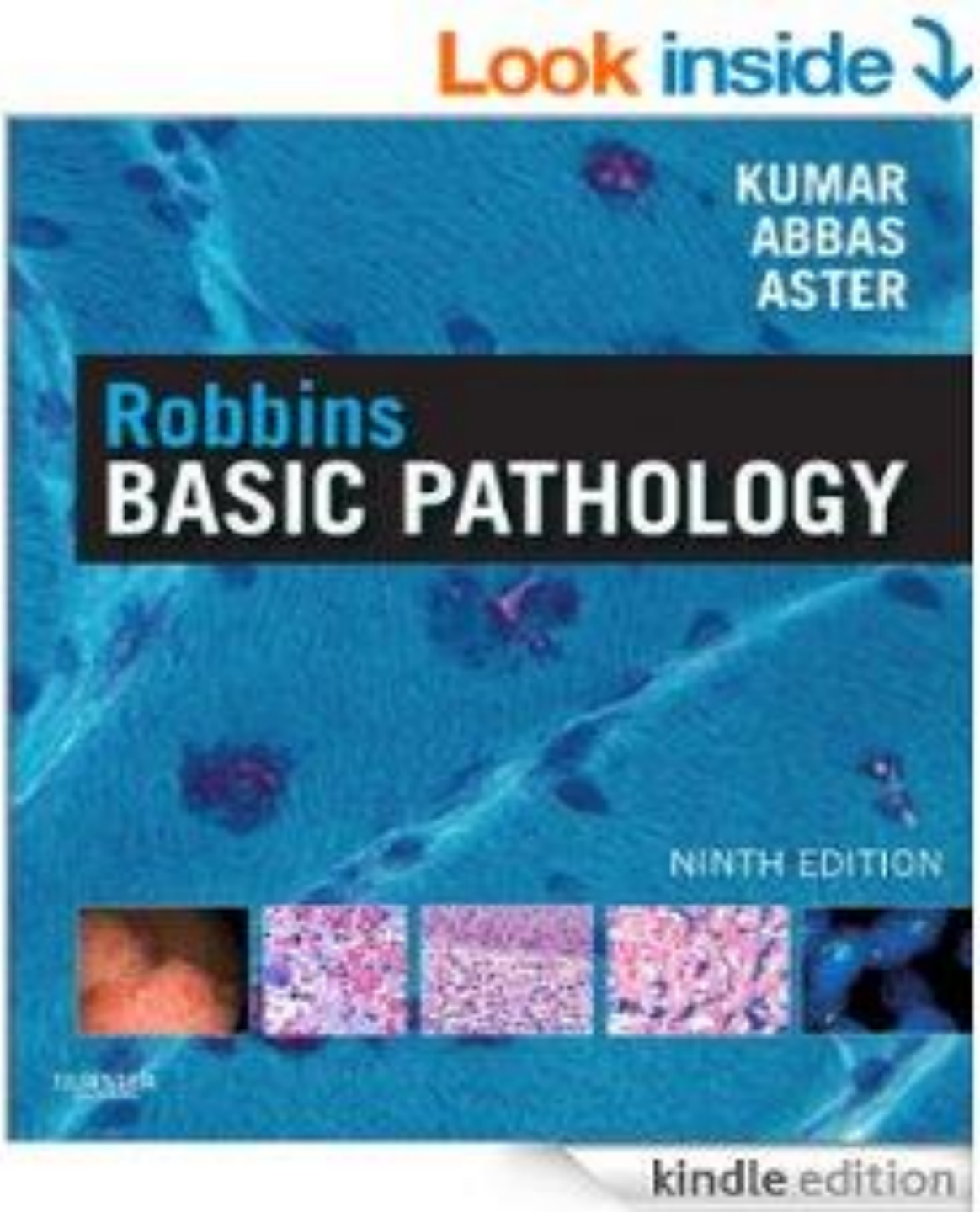


prognosis

- **Expected outcome of the disease, It is the clinician's estimate of the severity and possible result of a disease.**

Pathology Summary:

- **Etiology:**
  - Carcinogenesis. DNA Damage, Mutation.
- **Pathogenesis**:
  - Uncontrolled cell division, tumor.
- **Morphology**:
  - Enlarged lymphnodes, liver, spleen, microscopically – lymphoma cells.
- **Clinical Features**:
  - Fever, Wt loss, tumor-Ln, Liver, Spleen.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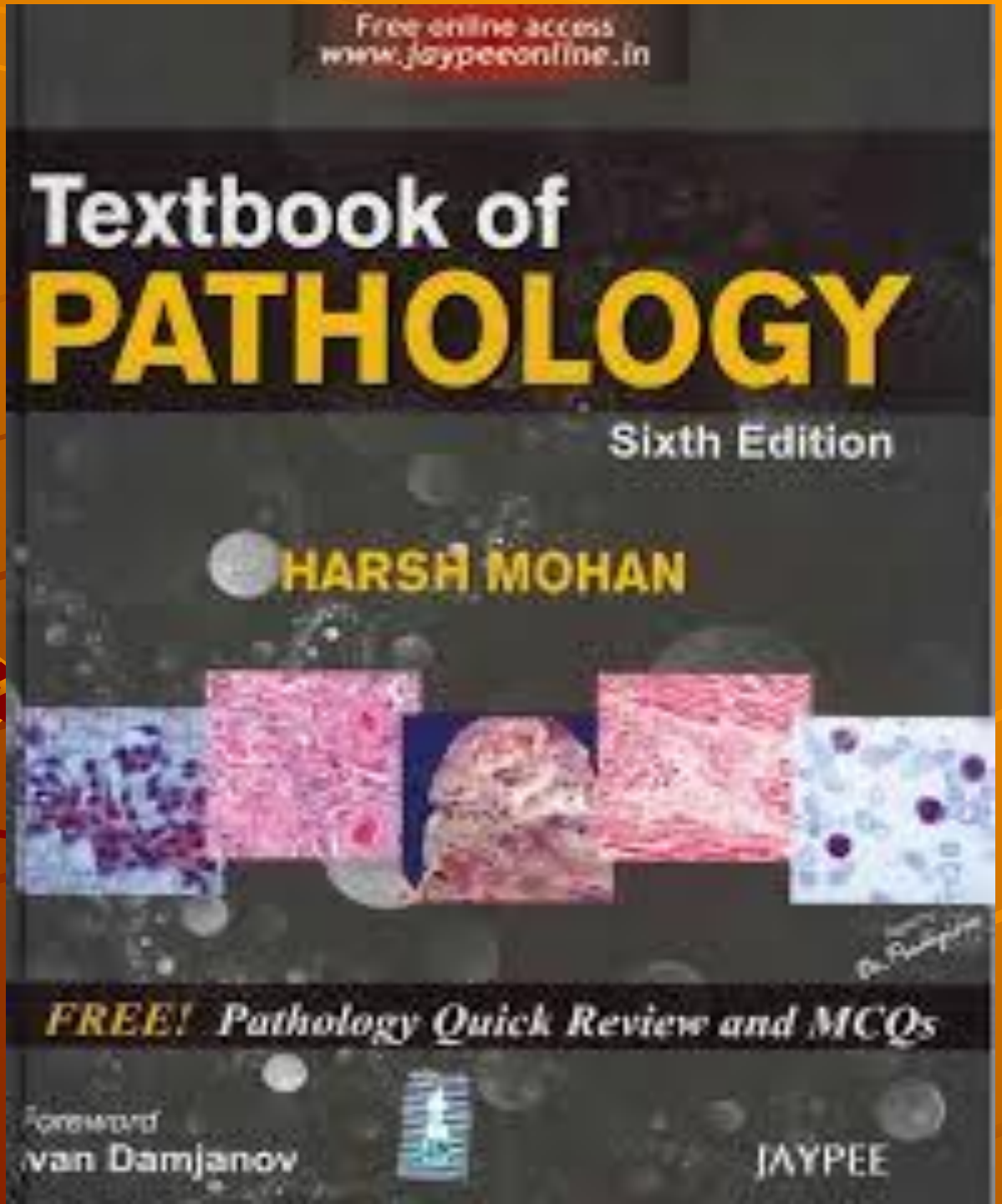
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