

# **Introduction to Cellular Pathology**

# Lecture Objectives

At the end of this lecture, you must be able to:

- Define Cellular Pathology
- State the roles of cellular pathology lab
- Describe cellular pathology workflow
- Identify hazards in cellular pathology lab
- State safety measures in cellular pathology lab

# What is Cellular Pathology?

- Is the branch of pathology that involves the study of structural and functional changes in cells, tissues and organs that underlie disease.
- Two main subdivisions within cellular pathology:-
  - I. **Histopathology**- the study of diseased tissue
  - II. **Cytopathology** - the study of disease changes within cells

# Types of Specimens in Cellular Pathology Lab

- Human tissues come from surgery and post-mortem room.
- Types of tissue obtained:
  - 1. Biopsy**
    - **Incisional biopsy** -small piece of lesion or tumour sent for diagnosis before final removal of lesion or tumour
    - **Excisional biopsy** -If whole tumour or lesion is sent for examination and diagnosis

# Types of Specimens in Cellular Pathology Lab

- **Punch biopsies** -punches are used to remove a small piece of suspicious tissue for examination (often from skin)
- **Curettings** - tissue is removed in small pieces from the lining of the uterus or cervix
- **Core biopsies** -a small tissue sample is removed using a special needle sometimes through the skin (percutaneously)

# Types of Specimens in Cellular Pathology Lab

## 2. Tissues from autopsy

- Determining cause of death
- Research into causes and mechanisms of death
- Education of undergraduate and postgraduates

## 3. Fluid

- Individual cells rather than groups of cells e.g. pleural fluid, cerebrospinal fluid

# Types of Preparations in Cellular Pathology Lab

## Whole mount

- Preparations of entire organs.

## Sections

- Tissue cut in about 3-5mm thick for processing and 5 $\mu$ m thick sections cut on a microtome.

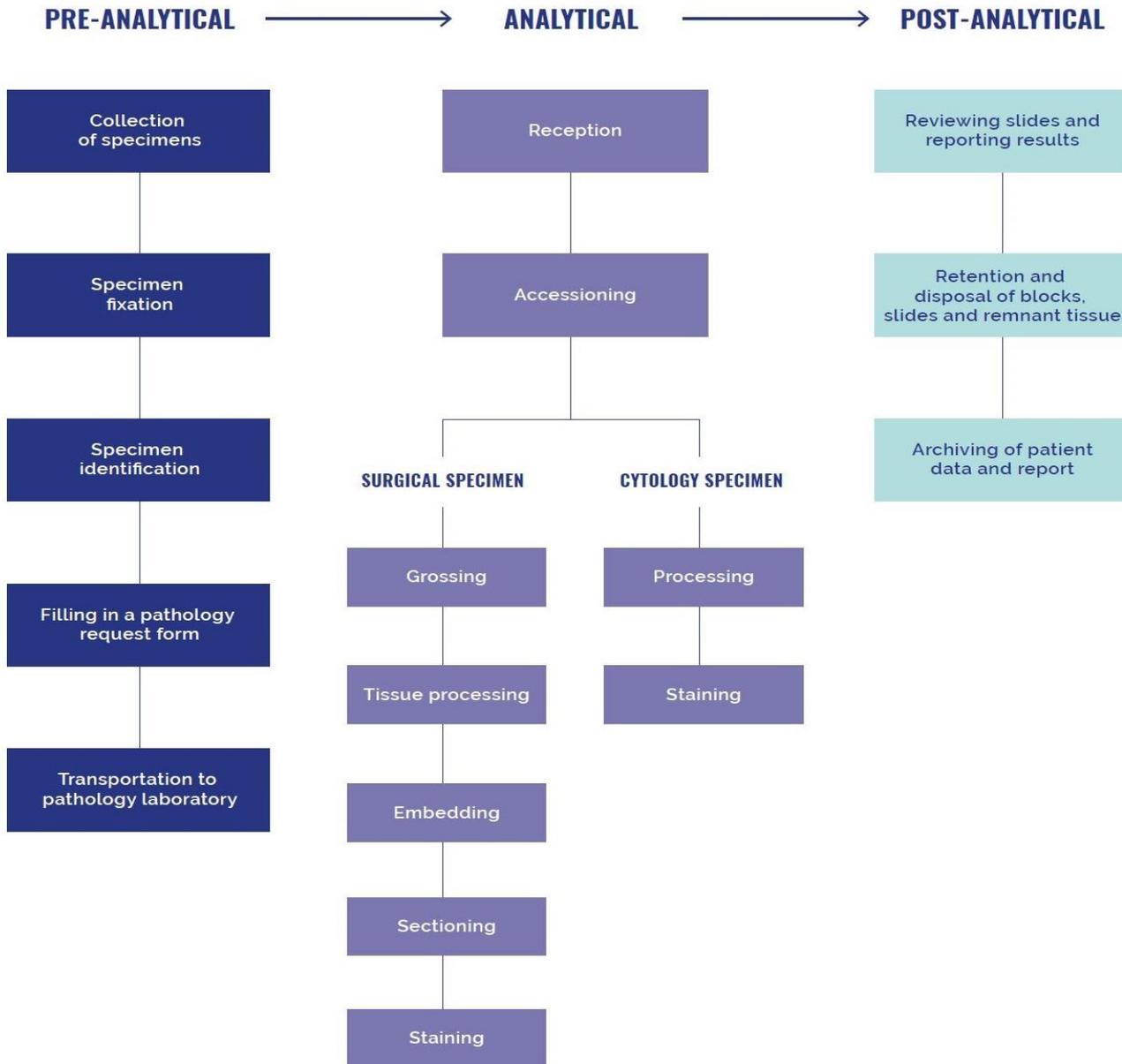
## Smears

- Made from blood, bone marrow or any fluid such as pleural fluid or ascitic fluid.

# Roles of Cellular Pathology

- To establish diagnosis in certain diseases or organs.
- To determine the cause of certain diseases.
- For identification of the nature of tumors or giving diagnosis and prognosis.
- In medico-legal cases.
- Pathogenetical Investigations in experimental animals.

# Cellular Pathology Workflow



# **Hazards and Safety in the Cellular Pathology Laboratory**

# Types of Hazards

- Hazards are divided into two broad categories, health and physical.

## Health Hazards

1. **Biohazards** can be infectious agents themselves or items contaminated with them.
- In Cellular Pathology lab:
    - Concerns are areas of frozen sections, autopsy and grossing due to the handling of fresh tissue.

# Types of Hazards

**2. Irritants** are chemicals that cause reversible inflammatory effects at the site of contact with living tissue e.g. eyes, skin, respiratory tract.

e.g. Formaldehyde, methanol

**3. Corrosive chemicals** When exposed to living tissue, destruction or irreversible alteration occurs. If inhaled or ingested, cause severe damage to the gastrointestinal and respiratory tracts.

e.g. Glacial acetic acid, hydrochloric acid, chromic acid

# Types of Hazards

**4. Sensitizers** cause allergic reactions in a substantial proportion of exposed subjects

e.g. formaldehyde

**5. Carcinogens** induce tumors in experimental animals exposed to unrealistically high dosages.

e.g. include chloroform, chromic acid, dioxane, formaldehyde, nickel chloride, and potassium dichromate, auramine O, basic fuchsin, ponceau 2R and any dye derived from benzidine (including Congo red, diaminobenzidine and Chlorazol black).

# Types of Hazards

**6. Toxic materials (poisons)** are capable of causing death by ingestion, skin contact or inhalation at certain specified concentrations.

- Use extreme caution when handling toxic substances; avoid highly toxic ones if possible.

e.g. Methanol, chromic acid, osmium tetroxide and uranyl nitrate are highly toxic, xylene and toluene and benzene, chloroform, methyl methacrylate, mercuric chloride, xylene etc

# Types of Hazards

## Physical Hazards

1. **Ignitables** are solids or liquids which are capable of being set afire.
  - i. **Combustibles** have flash points at or above a specified temperature. e.g. acetic acid
  - ii. **Flammable materials** have flash points below the specified temperature e.g. Acetone and ethanol
  
- The flash point of a liquid is the lowest temperature at which it emits vapors in such quantities that, when combined with air near the surface of the liquid, forms an ignitable mixture.

# Types of Hazards

**2. Explosive chemicals** are rare in histology, the primary example being picric acid.

- Certain silver solutions may become explosive upon aging; they should never be stored after use.

**3. Oxidizers** initiate or promote combustion in other materials. Harmless by themselves, they may present a serious fire risk when in contact with suitable substances.

e.g. Sodium iodate, Mercuric oxide and chromic acid.

# Control of Hazards

## Disposal of Biological Hazards:

- All tissue waste and material coming in contact with tissue should be disposed of in biohazard bags.
  - Bright red bags with biohazard symbol including sterilization indicator patch.



# Mechanical Hazards

- Sharp Instruments
  - Microtome knives are a major hazard:
    - Extreme care should be observed when cleaning and sharpening
    - Disposable blades should be placed in sharps container after use.
- Glass
  - Glassware should be checked for:
    - Chips and cracks , discard if defects are found
    - Vacuum desiccators are a major hazard if a crack develops in the glass.
- Electrical hazards
  - Should be grounded and condition of wires should be checked periodically.
  - All equipment checked should be documented.

# Chemical Hazards

- Employers should adhere to the following conditions:
  - Labelling hazardous chemicals
    - Identity of the chemical and appropriate hazard warnings (carcinogen, corrosive, explosive, etc.)
    - This applies to all commercially prepared reagents, lab-prepared reagents, stationary and permanent containers (formaldehyde containers), temporary containers used for transport and chemical waste containers.

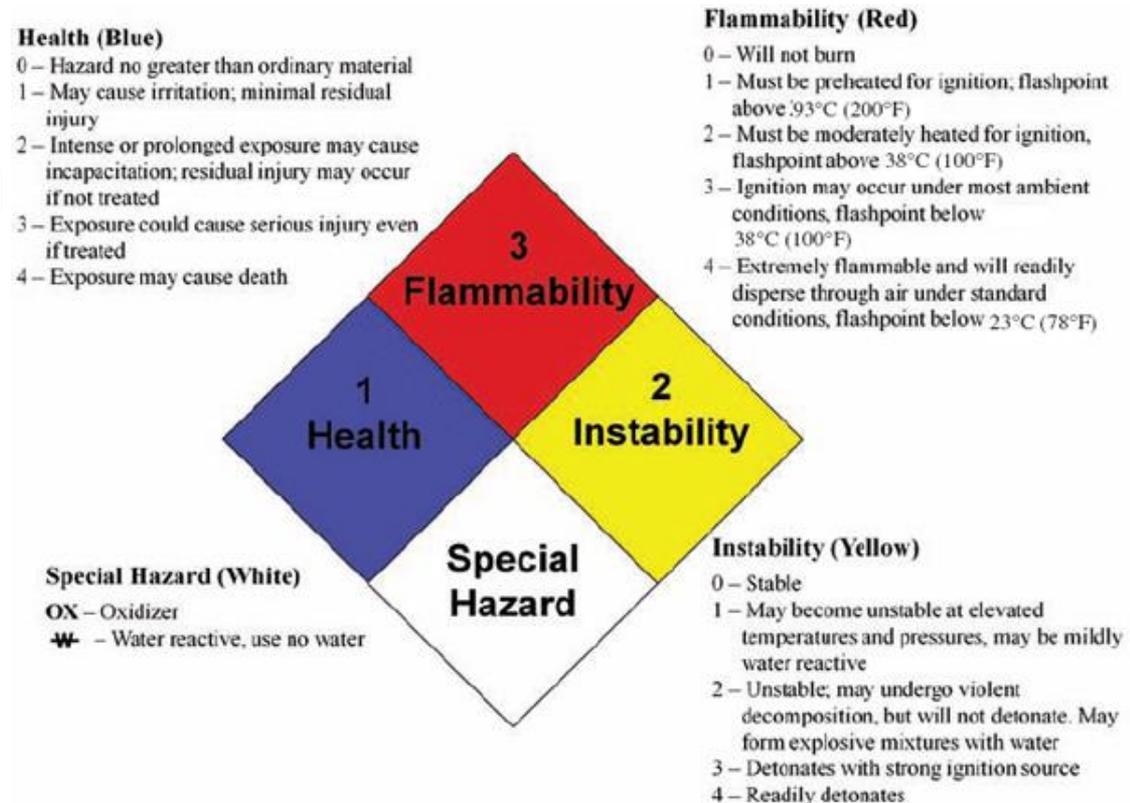


# Fire and Explosive Hazards

- Avoid open flames and sparks and ensure proper ventilation when handling and storing flammables.
- Hazard Identification
  - All chemicals must be labelled according to the approved guidelines

- 0 to 4 rating system used

- 4 = severe
- 3 = serious
- 2 = dangerous
- 1 = minor
- 0 = none



# Safety

- Safety procedure manual should be on the workbench
- Fire extinguishers, eye wash, shower stations and first-aid kits
- Safety protocol on handling of infectious materials
- PPE e.g. gowns, masks, goggles
- Appropriate extraction systems should be in place to minimize the levels of noxious vapours
- Biological safety cabinets

# References

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- Suvarna, S.K, Christopher L, Bancroft J.D, **Bancroft`s Theory & Practice of Histological Techniques**, 7<sup>th</sup> edition, Churchill Livingstone, NY, U.S.A.