Cellular adaptation (Part 2): Disorders of CELL MATURATION

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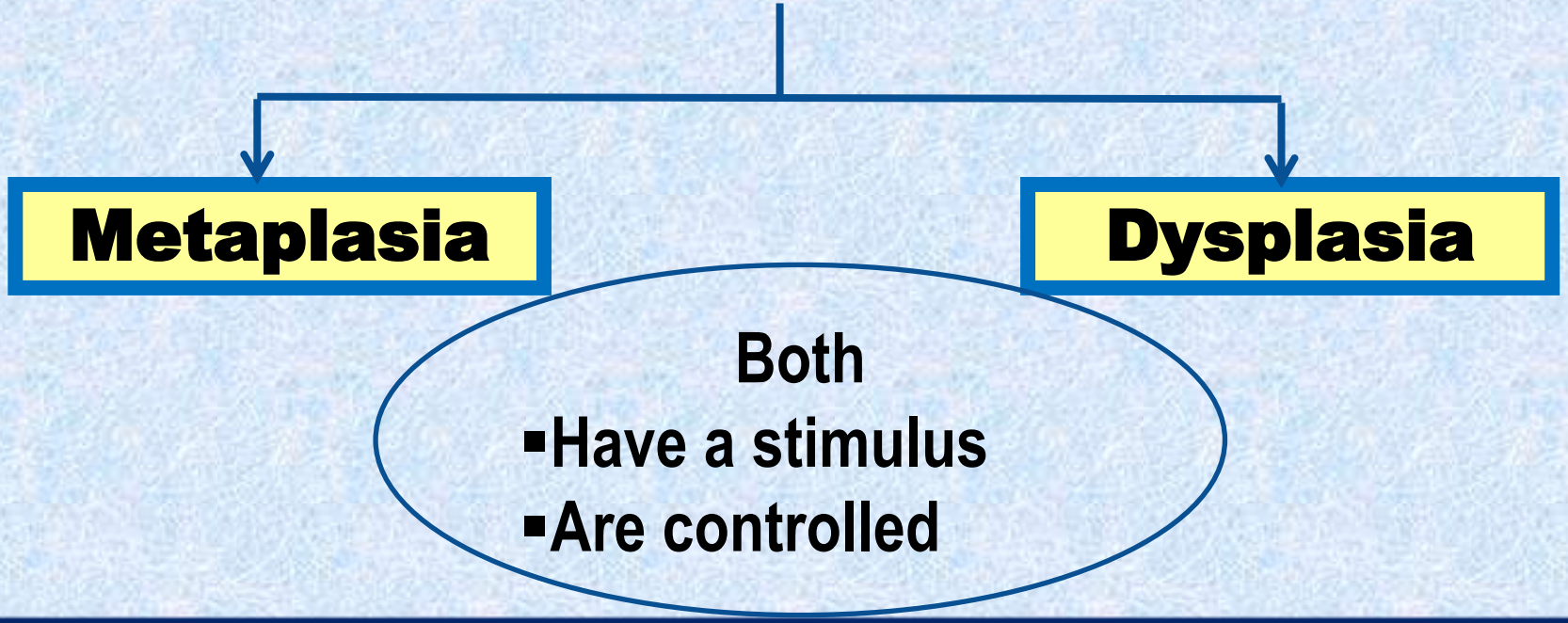
OUTLINES

By the end of this lecture; students should be able to learn the following:

- Define metaplasia, provide examples and identify its clinical significance.
- Define dysplasia and identify its sites, grades, and main features.
- In situ carcinoma
- Describe main difference between in situ and invasive carcinoma

Abnormal cell DIFFERNTIATION



Abnormal cell DIFFERNTIATION

METAPLASIA

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

Definition:

A change of one type of **differentiated (mature)** tissue to another type of **differentiated** tissue of the same category.

Types:

A. Epithelial metaplasia

B. Connective tissue metaplasia

C. Tumor metaplasia

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

A. Epithelial metaplasia:

1. Squamous metaplasia:

Definition: change of any type of epithelium change to squamous epithelium due to chronic irritation (as chronic infection or stones).

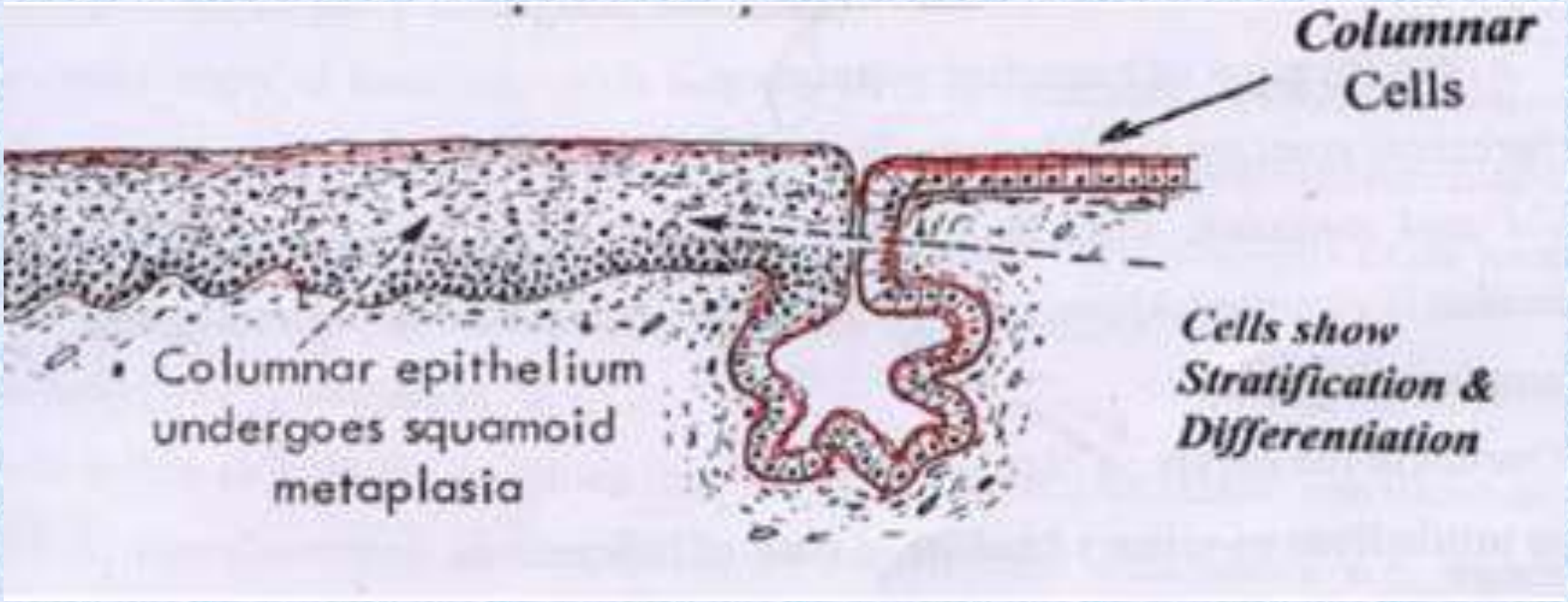
Examples:

- Urinary bladder: transitional → sq. epithelium in bilharziasis or stones
- Gall bladder: columnar to → sq. epithelium as in chronic cholecystitis and gall stones.
- Bronchi: pseudo-stratified columnar ciliated → squamous epithelium in cases of smoking, chronic bronchitis and TB.

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

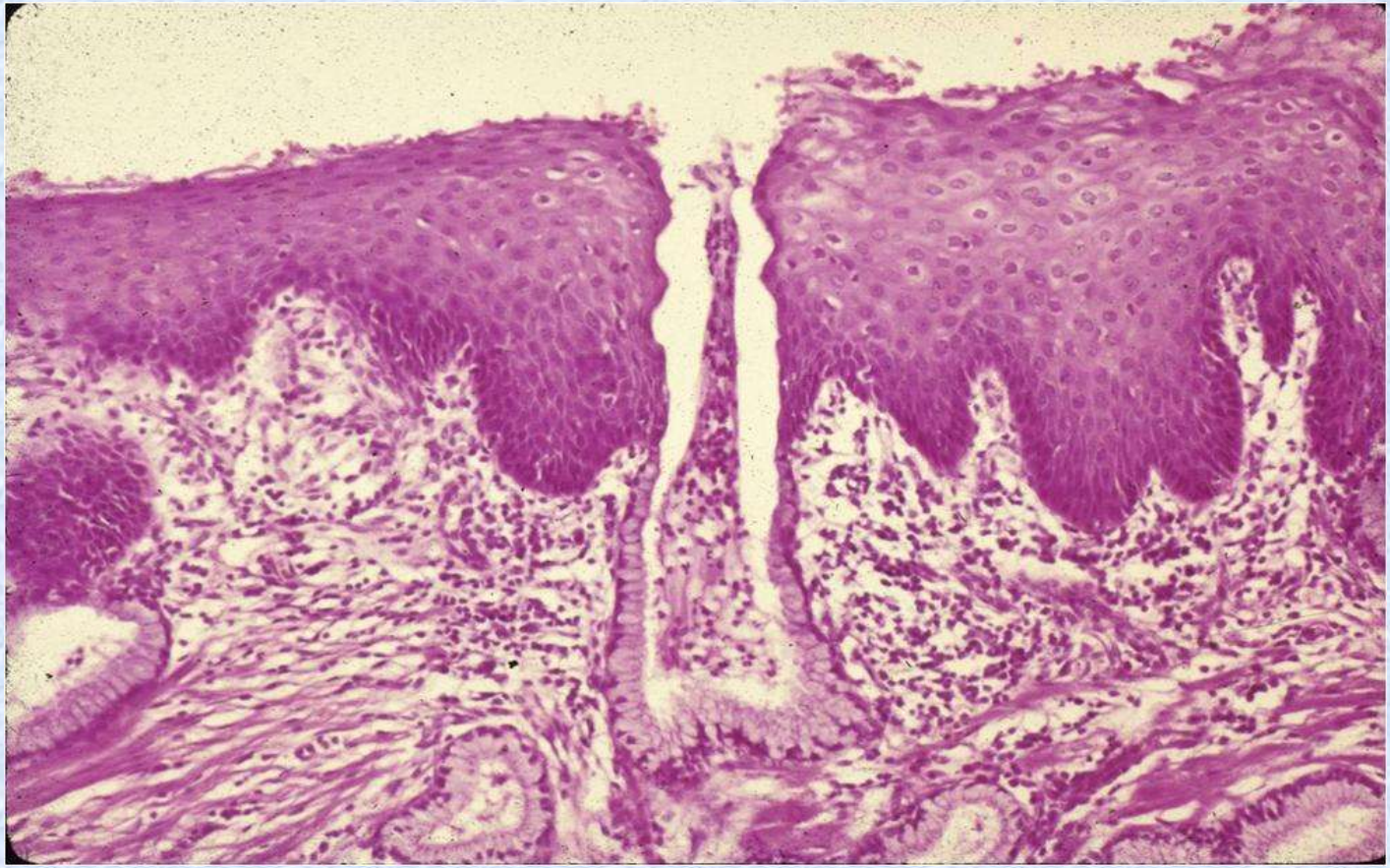
  A.Epithelial metaplasia:



Abnormal cell DIFFERNTIATION

- **Metaplasia:**

  A.Epithelial metaplasia:

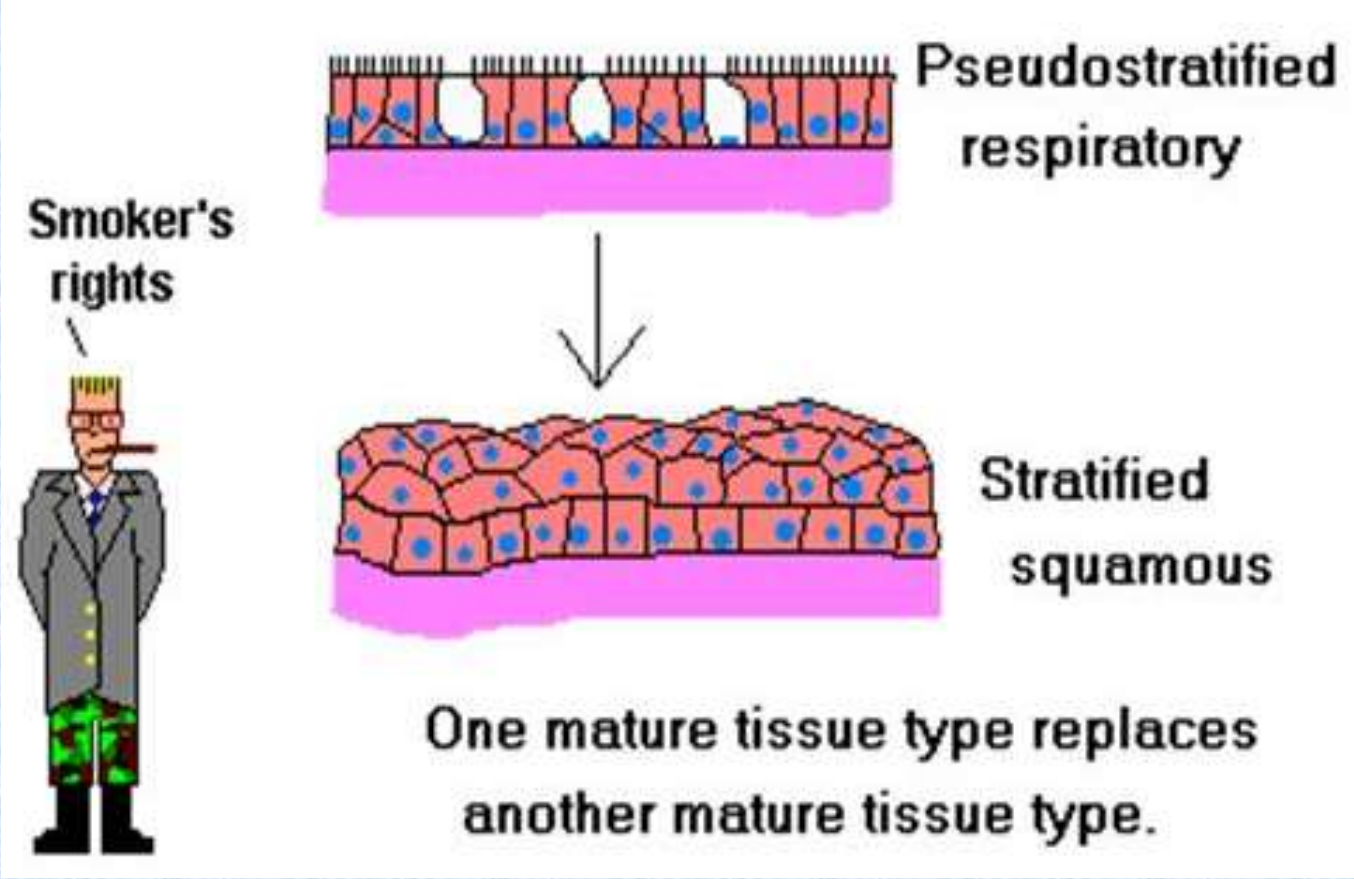


Endocervix……Comment???

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

A.Epithelial metaplasia:



Abnormal cell DIFFERNTIATION

- **Metaplasia:**

A.Epithelial metaplasia:

2. Glandular metaplasia:

Definition: means change of any type of epithelium into columnar epithelium →

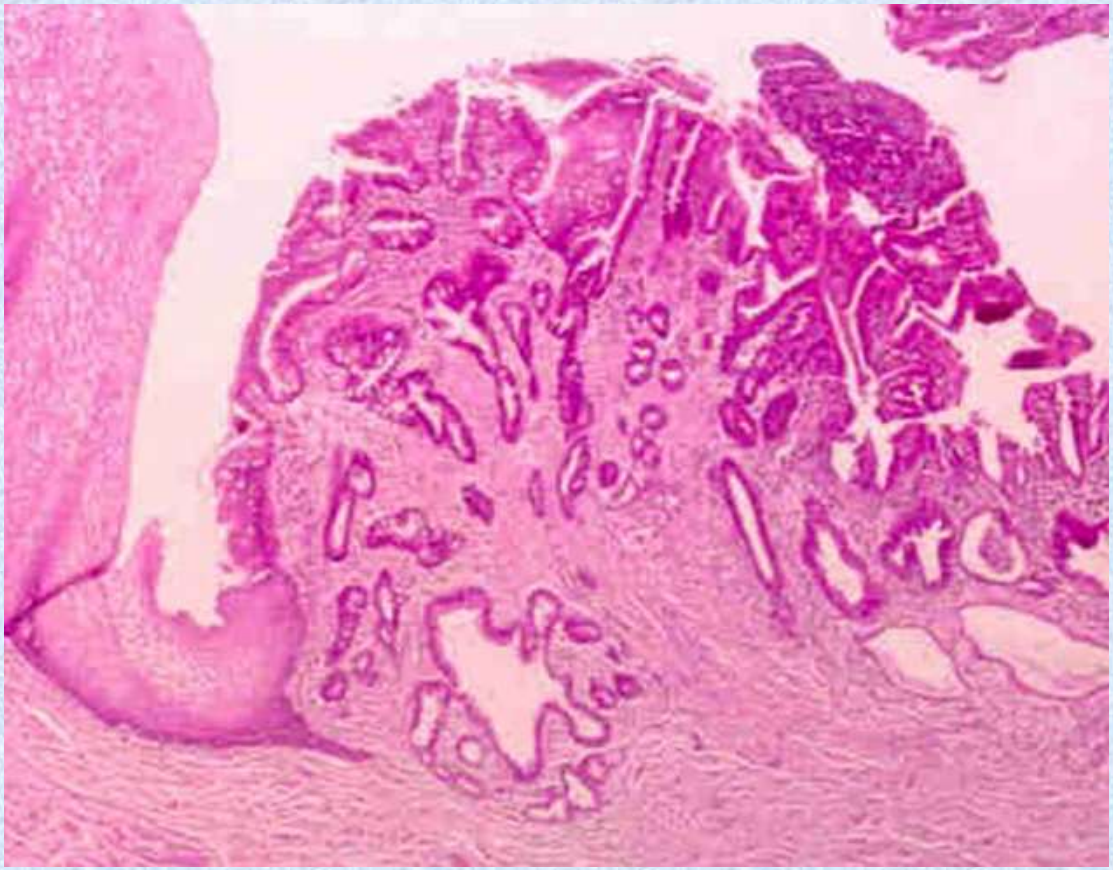
Examples:

- Oesophagus: squamous epithelium of lower esophagus change to → columnar epithelium in cases of reflux oesophagitis (Barrett's oesophagitis, pre-cancerous lesion)
- Uterus: squamous epithelium of the ectocervix → change to columnar epithelium in cases of cervical erosion.

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

  A.Epithelial metaplasia:



Lower oesophagus……..Comment???

Abnormal cell DIFFERNTIATION

- **Metaplasia:**

B. Connective tissue metaplasia:

- Osseus metaplasia: soft tissue lesions → bone due to dystrophic calcification. e.g.
  - Myositis ossificans: Haematoma → bone due to dystrophic calcification
  - Calcification in old scars and long standing goiter, and caseous foci of tuberculosis.

D. Tumor metaplasia:

- Adenocarcinoma of uterus, gall bladder or lung may contain foci of squamous cell carcinoma.
- Adenocarcinoma of the breast may contain foci of mucinous metaplasia.

Abnormal cell DIFFERNTIATION

DYSPLASIA

Abnormal cell DIFFERNTIATION

- **Dysplasia:**
  - ***Definition:*** means partial loss of differentiation.
  - ***Features***
    - The involved epithelium shows features of **cellular atypia or features of malignancy**
      - Pleomorphism (variation in cell size and shape).
      - Hyperchromatic nuclei
      - Increased nucleo-cytoplasmic ratio
      - Increased mitotic activity.
      - Loss of polarity (orientation) of cells.
      - Impaired function.

Abnormal cell DIFFERNTIATION

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      - Increased mitotic activity.
      - Loss of polarity (orientation) of cells.
      - Impaired function.
      - **No invasion of basement membrane.**

Abnormal cell DIFFERNTIATION

- **Dysplasia:**
  - ***Aetiology:***

    It represents reaction to underlying inflammation or to chronic irritation.
  - ***Grades:***
    1. Mild: Dysplastic changes involve only basal 1/3 of the epithelium.
    2. Moderate: Dysplastic changes involve only basal 2/3 of the epithelium.
    3. Severe: Dysplastic changes involve all layers of the epithelium.

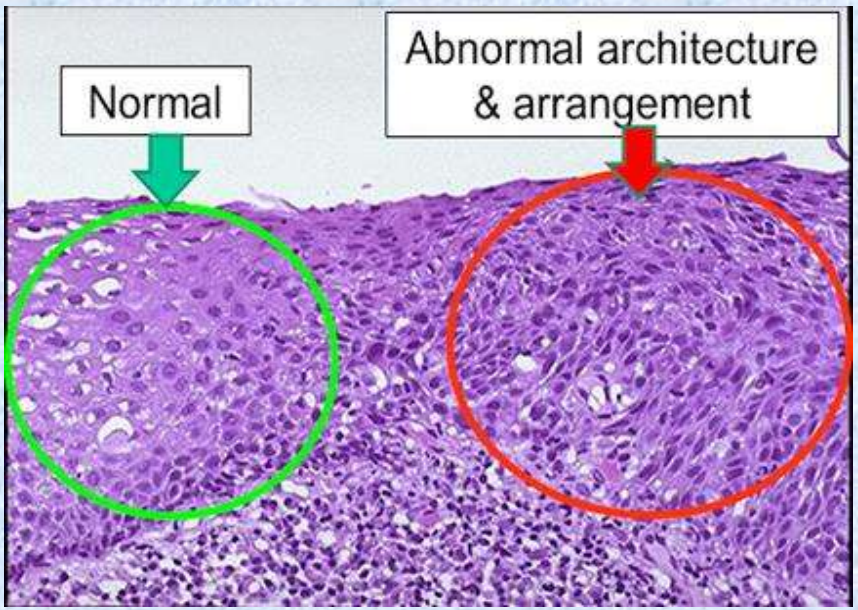
    NB: Sever dysplasia = carcinoma in situ

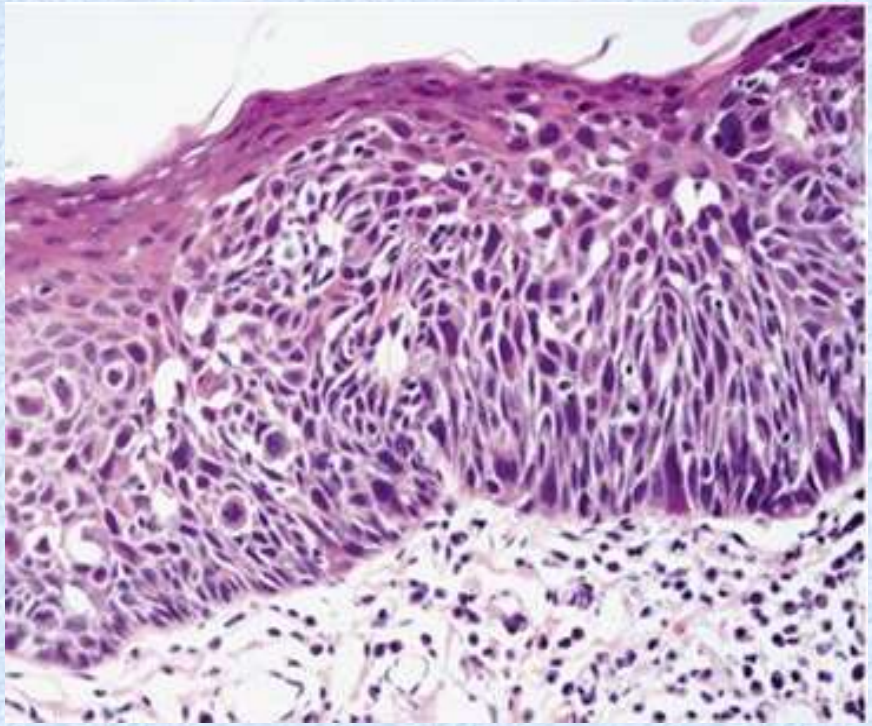
Abnormal cell DIFFERNTIATION

- **Dysplasia:**
  - ***Common sites***
    1. Cervix uteri
    2. Skin and mucous membranes
    3. Liver
  - ***Fate:***
    - ➢ Mild and moderate dysplasia are **reversible** when the evoking stimulus is removed.
    - ➢ Severe degree is **pre-malignant.**

Abnormal cell DIFFERNTIATION

- **Dysplasia:**





Abnormal cell DIFFERNTIATION

- **Carcinoma in situ:**

  Other names: Severe dysplasia, intra-epithelial carcinoma **OR** Non-invasive carcinoma

  Definition:

  - It is severe dysplasia of surface epithelium in which malignant cells are confined to the surface epithelium with **NO invasion of basement membrane**
  - Once the basement membrane is invaded, the lesion becomes invasive malignant tumor

  Sites: epithelium of skin, urinary bladder, cervix, bronchus and mammary ducts

Abnormal cell DIFFERNTIATION

- **Carcinoma in situ:**

  Grossly: appears as leukoplakia or thickening of the affected epithelium. No masses or complaint in most cases

  Microscopically: dysplastic features (*describe*) of the whole thickness surface epithelium with NO invasion of basement membrane

  Diagnosis:

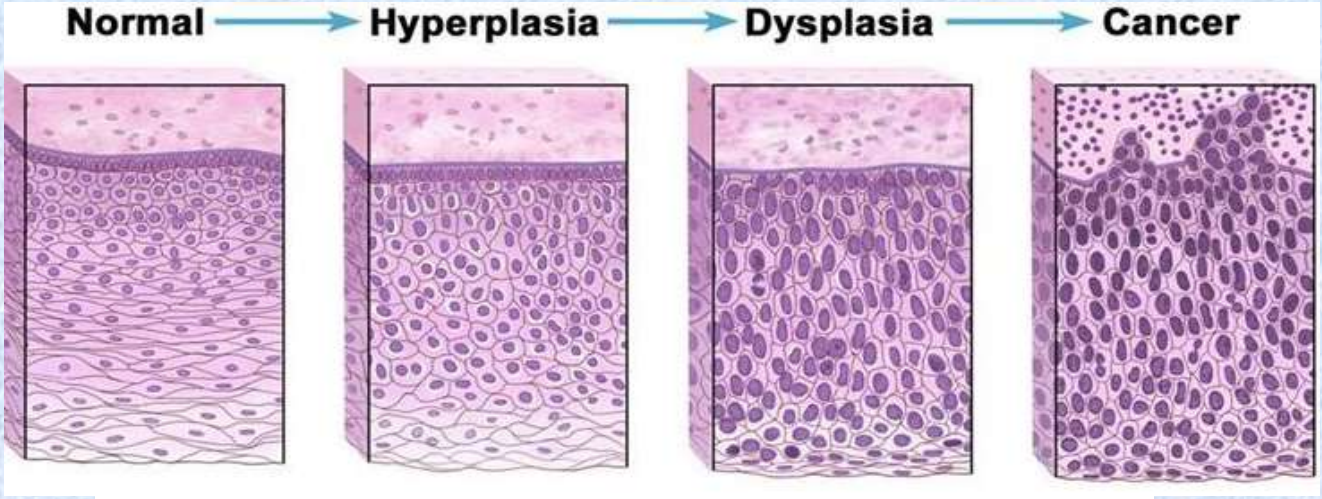
  - NO masses could be seen
  - Usually detected by screening of suspected cases, e.g. cytological screening of smears of uterine cervix.

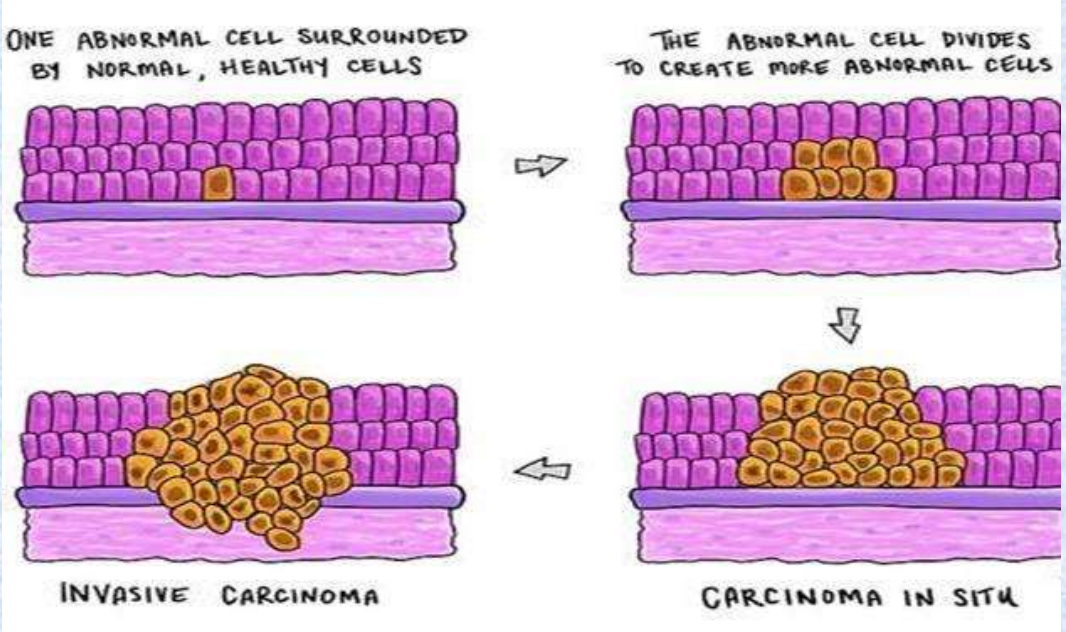
  Prognosis (Fate):

  - Excellent: Can be cured if excised before invasion
  - If not treated, progression to invasive carcinoma is common

Abnormal cell DIFFERNTIATION

- **Carcinoma in situ:**





NEOPLASIA
(Introduction)

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2024

OUTLINES

By the end of this lecture; students should be able to learn the following:

- Define the term neoplasia and identify other important terminologies
- Identify main features of neoplasms
- Differentiate between hyperplasia and neoplasia
- Know common tumor worldwide and common tumors in Egypt (Cancer epidemiology)

INTRODUCTION

Introduction

- ***Definition***:
  - Literally neoplasia means “New growth”
  - Neoplasm: a **tissue mass** formed due to uncontrolled and unlimited proliferation of cells independent of stimuli.
  - In neoplasia, the normal regulatory mechanisms of cell cycle, cell differentiation and cell contact are **defective**.
  - Hyperplasia, metaplasia, and dysplasia represent three patterns of **controlled** non-neoplastic growth

Introduction

- ***Terminology:***
  - **Hyperplasia**: Increase the size of an organ or tissue due to increased number of its cell constituent.
  - **Hypertrophy**: Increase the size of an organ or tissue due to increased size of its cell constituent.

    Q: Which is more serious; hyperplasia or hypertrophy? Why?
  - **Metaplasia**: Change of one type of differentiated tissue to another differentiated type of the same category.
  - **Dysplasia**: disorder of maturation in which epithelial cells vary in size, shape and orientation with hyperchromatic nuclei.

Introduction

- ***Terminology:***
  - **Oncology**: Subject concerned with study of neoplastic growth.
  - **Oncogenesis:** Mechanisms of tumor initiation, growth, invasion and spread or metastasis.
  - **Tumor**: Originally refers to any swelling but currently used almost exclusively to refer to a neoplastic growth
  - **Cancer**: A common term used for **all malignant** neoplasms
  - **Differentiation**: Extent to which tumor cells resemble their normal cells; morphologically and functionally.
  - **Anaplasia**: Lack of differentiation; a neoplasm composed of markedly less differentiated (less mature) or undifferentiated cells.

Introduction

- ***Terminology:***
  - **Benign tumor**: A well differentiated neoplasm that tends to grow slowly, does not metastasize, and is mostly non-life threatening.
  - **Malignant tumor**: A variably differentiated neoplasm that tends to grow rapidly, often metastasizes, and frequently causes death of the host.
  - **Carcinoma**: Malignant tumor of epithelial cells
  - **Sarcoma**: Malignant tumour of mesenchymal cells
  - **Metastasis**: Migration of tumor cells to an organ or site that is remote from the primary site with formation of secondary tumor masses (**Is metastasis important from clinical point of view?**)

GENERAL FEATURES OF NEOPLASMS

Features of neoplasms

- ***General features of neoplasms***:
  - Arise spontaneously (have no stimulus) or due to pathological stimuli.
  - Continue to grow even after removal of the stimulus, if any.
  - Purposeless (have no useful function).
  - Do not obey control mechanisms of cell growth and differentiation.
  - **Monoclonality** is the basis of neoplasia and **divergent differentiation** occurs during tumour progression.
  - Variable degree of cellular maturation.

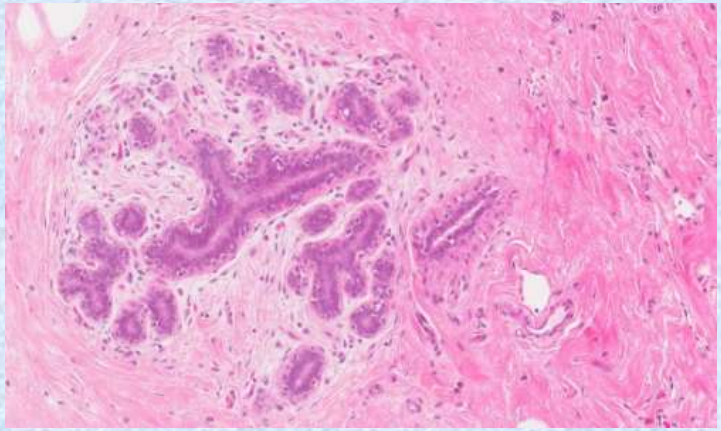
Features of neoplasms

- **Differences between neoplasia and hyperplasia?**

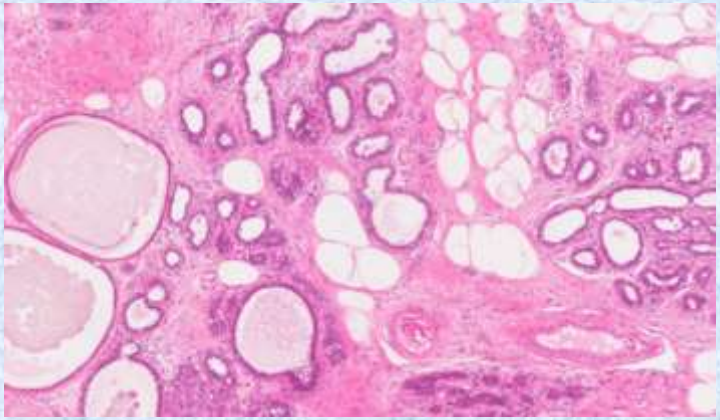
Hyperplasia	Neoplasia
Controlled growth disturbance	Uncontrolled growth disturbance
Growth regulatory mechanisms are preserved	Growth regulatory mechanisms are disturbed
Usually initiated by a stimulus	Independent of a stimulus
Limited cell proliferation	Unlimited cell proliferation
Reversible (after removal of the cause)	Irreversible
The cells are mature	Variable degree of maturation

Features of neoplasms

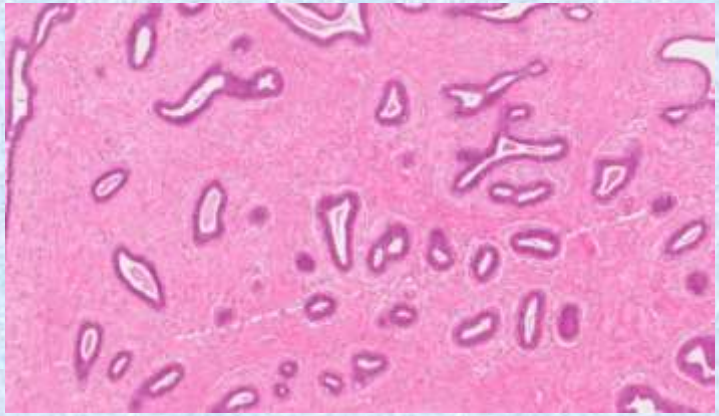
- **Differences between neoplasia and hyperplasia?**



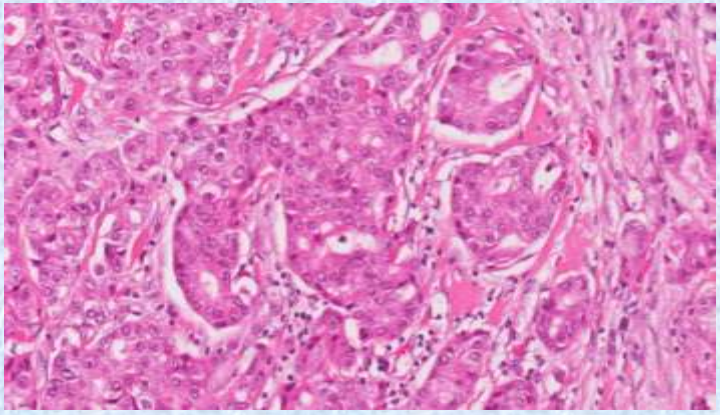
Normal breast



Hyperplasia, breast



Benign tumour, breast

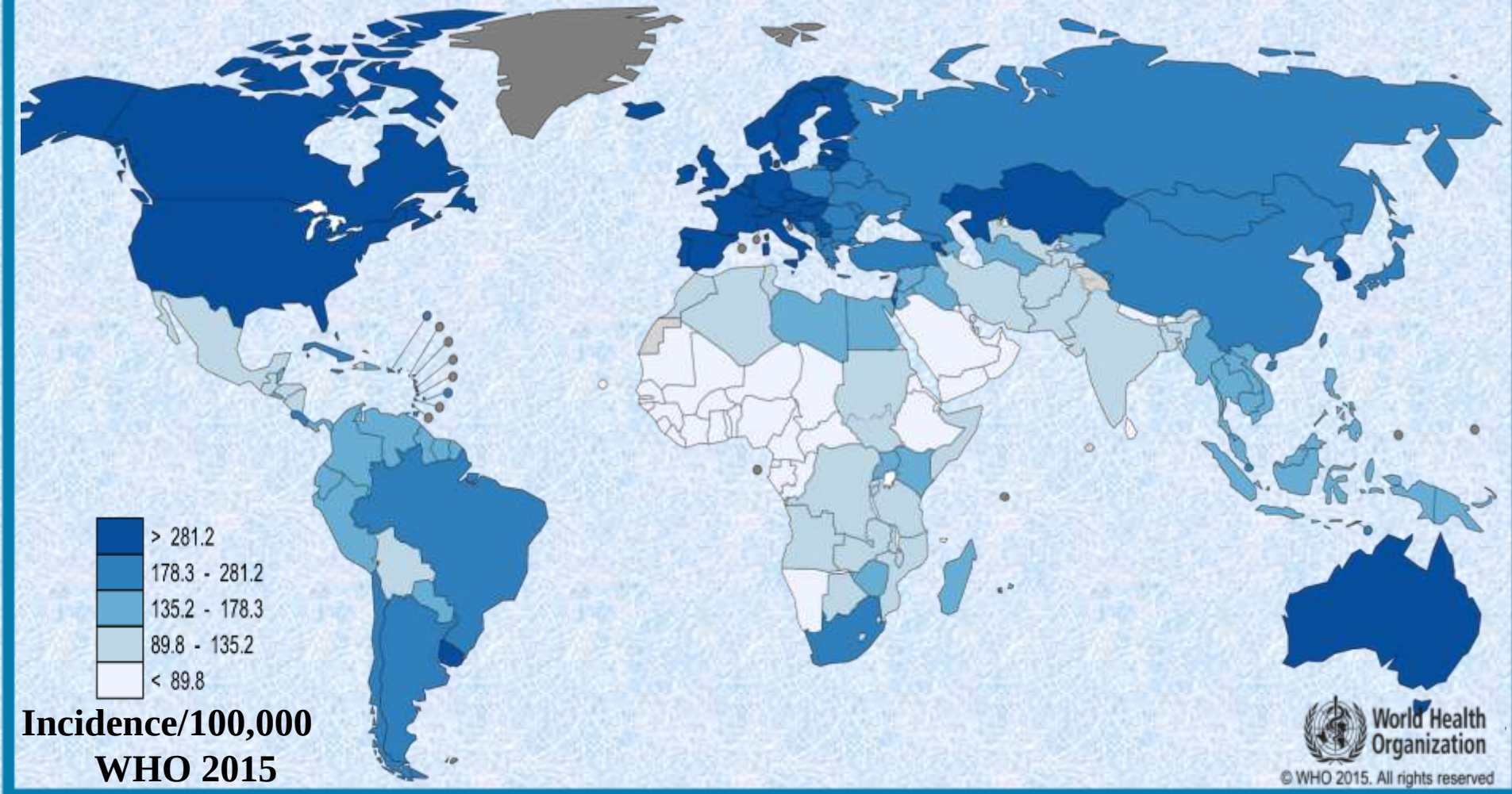


Malignant tumour, breast

CANCER EPIDEMIOLOGY

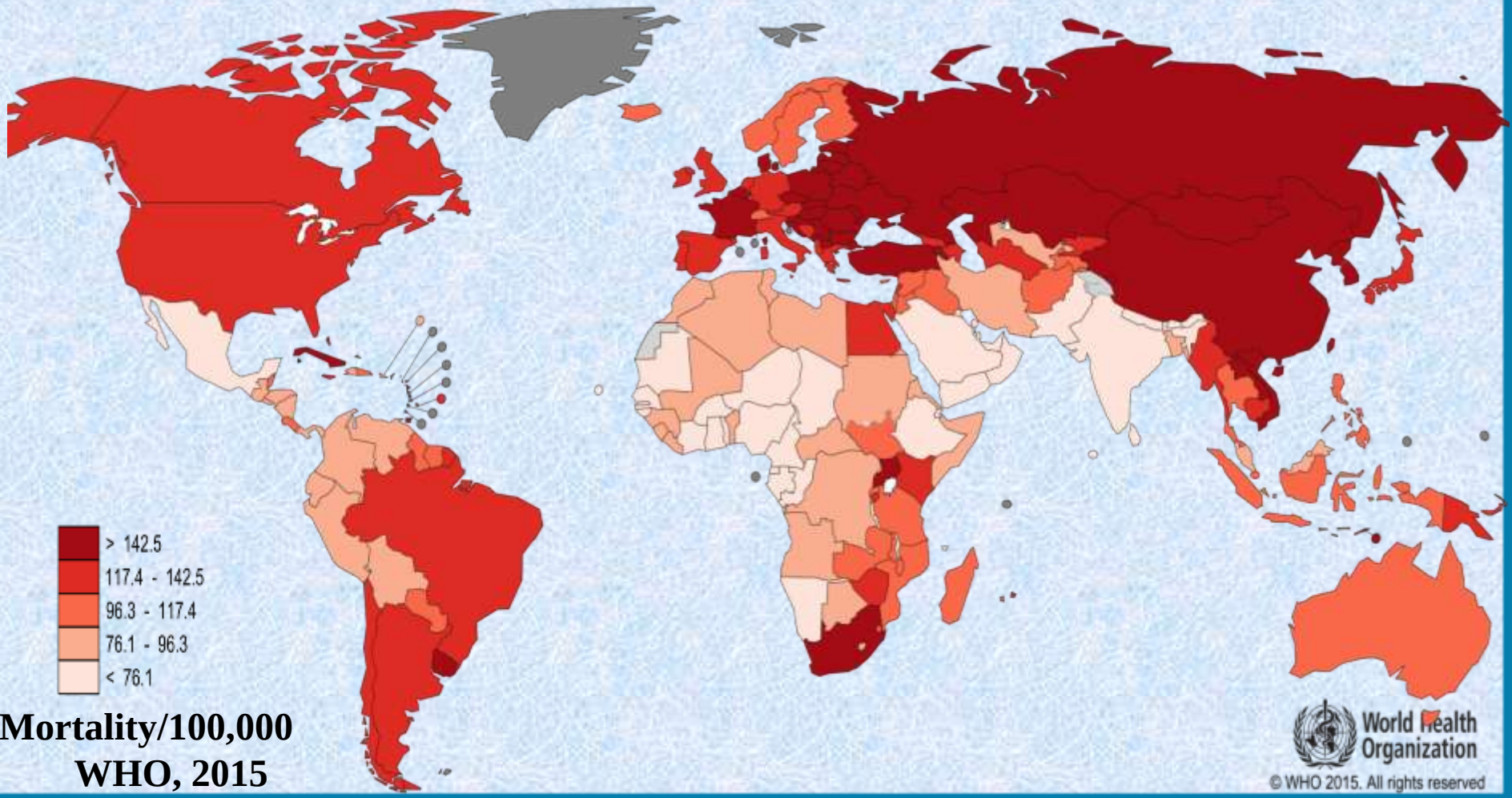
Epidemiology

- **Cancer is a common disease**



Epidemiology

- **Cancer is a common cause of death**



Epidemiology

- Malignant tumors are **frequent** worldwide
- Malignancy is a **common cause of death** worldwide
- Tumors vary according to geographic distribution according to environmental, ethnic and social factors
- **Commonest tumors worldwide** are breast, prostate, lung, and colorectal cancer ***(according to WHO registries 2020)***
- **Commonest tumors in Egypt** ***(according to WHO registries 2020)***
  - ***For males*****:** prostate, lung and bladder cancer in **males.**
  - ***For females***: breast and colorectal carcinoma
- ***Clinically***; benign and malignant tumors can be similar to inflammatory and developmental lesions.

GOOD LUCK

Dr. Ahmed Roshdi