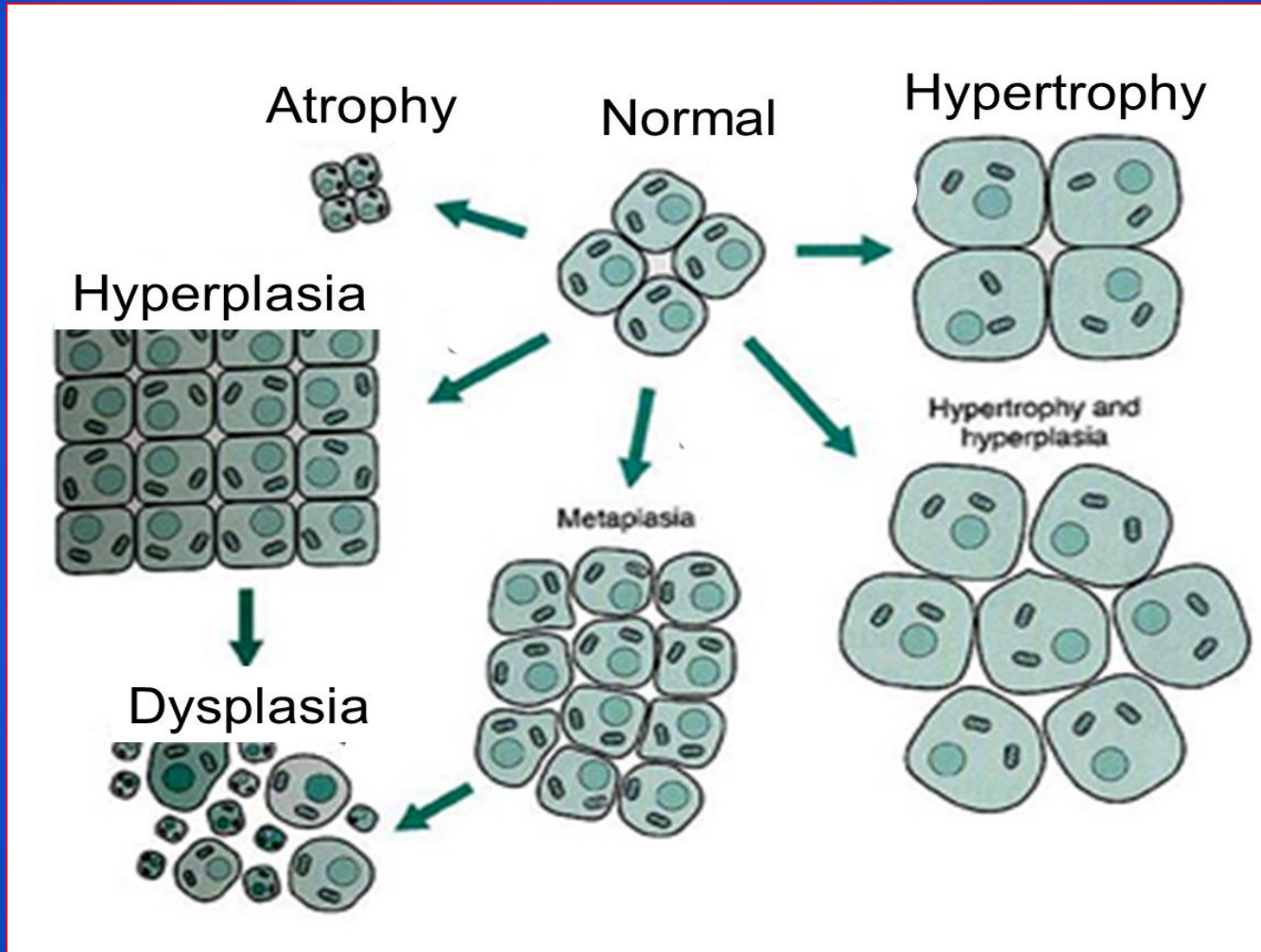# Principles of Surgical Oncology

Salah R. Elfaqih
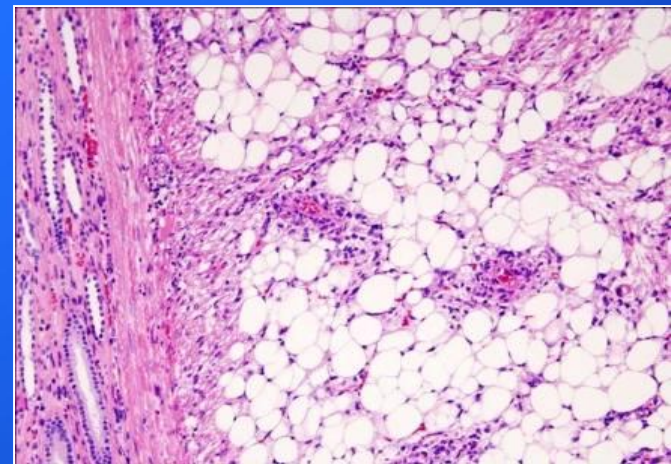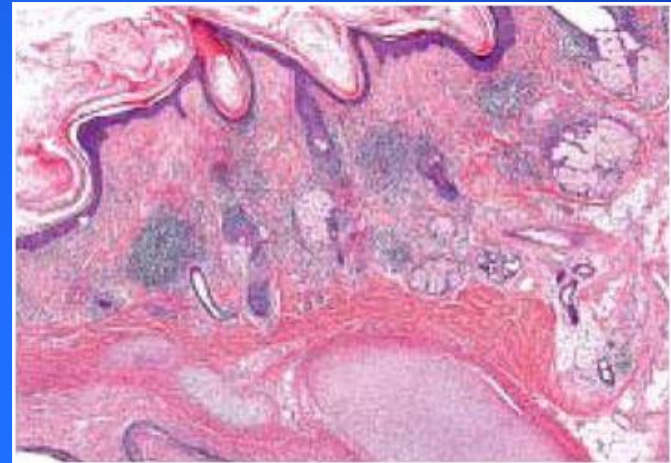
Pathological cell changes

Types of Tumors

- **Benign**
- **Malignant**
  - Carcinoma
  - Sarcoma
- **Teratoma**
- **Hamartoma**

Hamartoma vs Teratoma

Cancer Nomenclature

Types of Malignancies

Benign vs Malignant

Benign

- **Encapsulated**
- **No invasion**
- **No metastasis**

Malignant

- **Non encapsulated**
- **Usually invade**
- **Metastasis**

A — Intact skin surface, Expansile growth, Capsule, Homogeneous cut surface

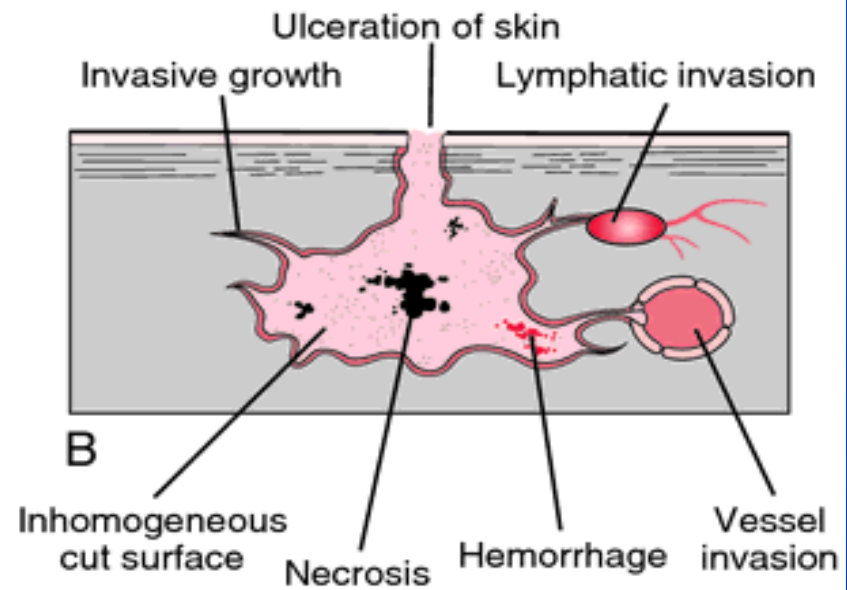B — Ulceration of skin, Invasive growth, Lymphatic invasion, Inhomogeneous cut surface, Necrosis, Hemorrhage, Vessel invasion
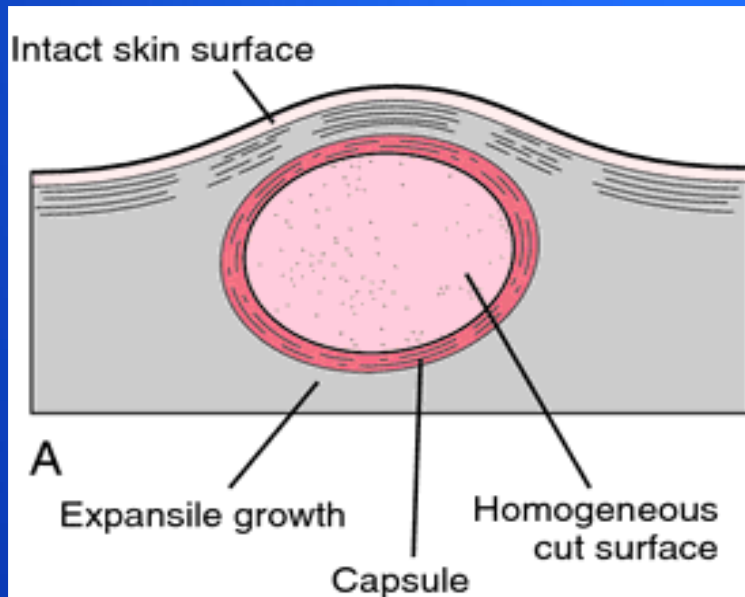
Benign vs Malignant Tumors
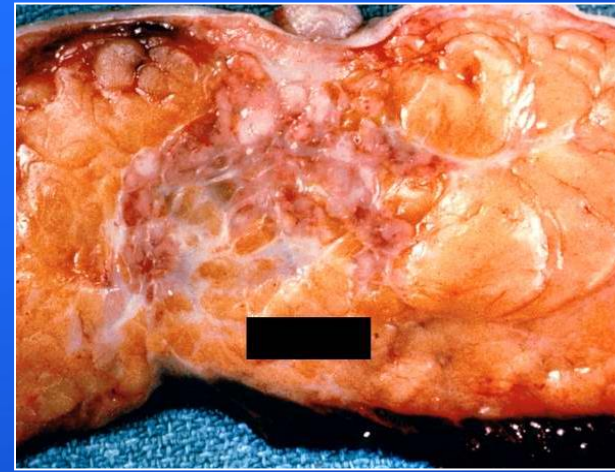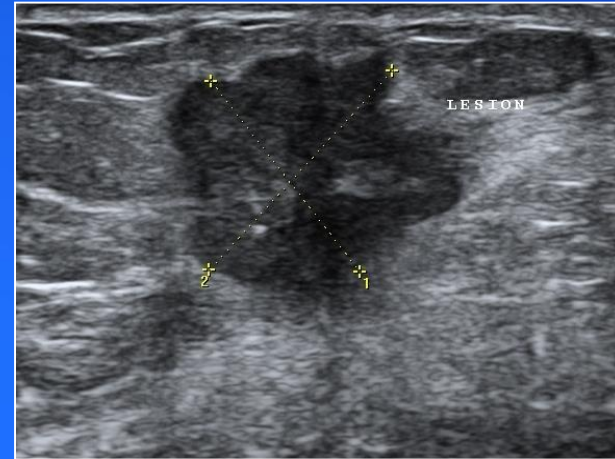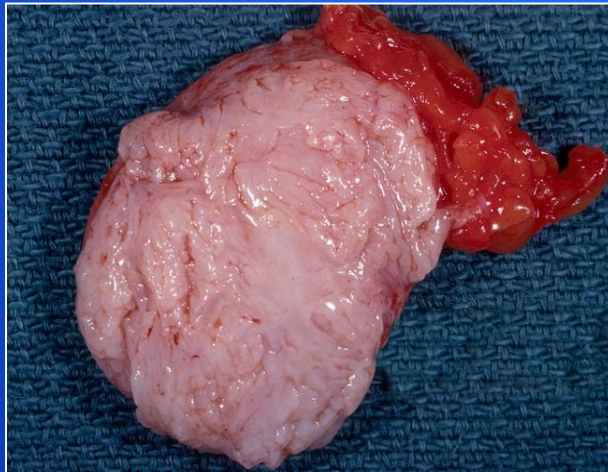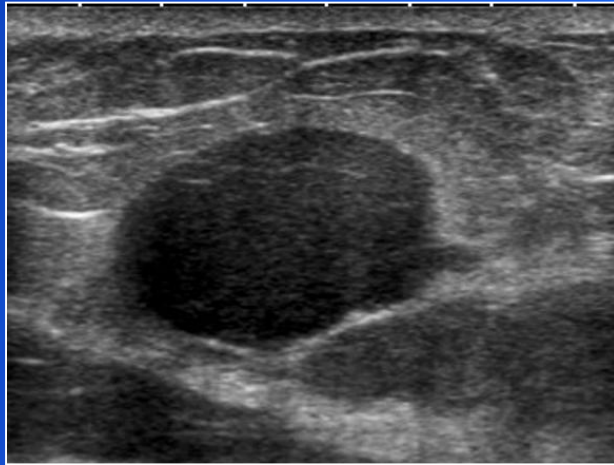
Local Effects of Tumours

What are the treatment implications

Local excision for benign tumors and radical excision for malignant

Normal cell & malignant cell

Loss of Normal Growth Control

Characteristics of malignant cells

There are molecules on the surface of the cell which match its neighbours

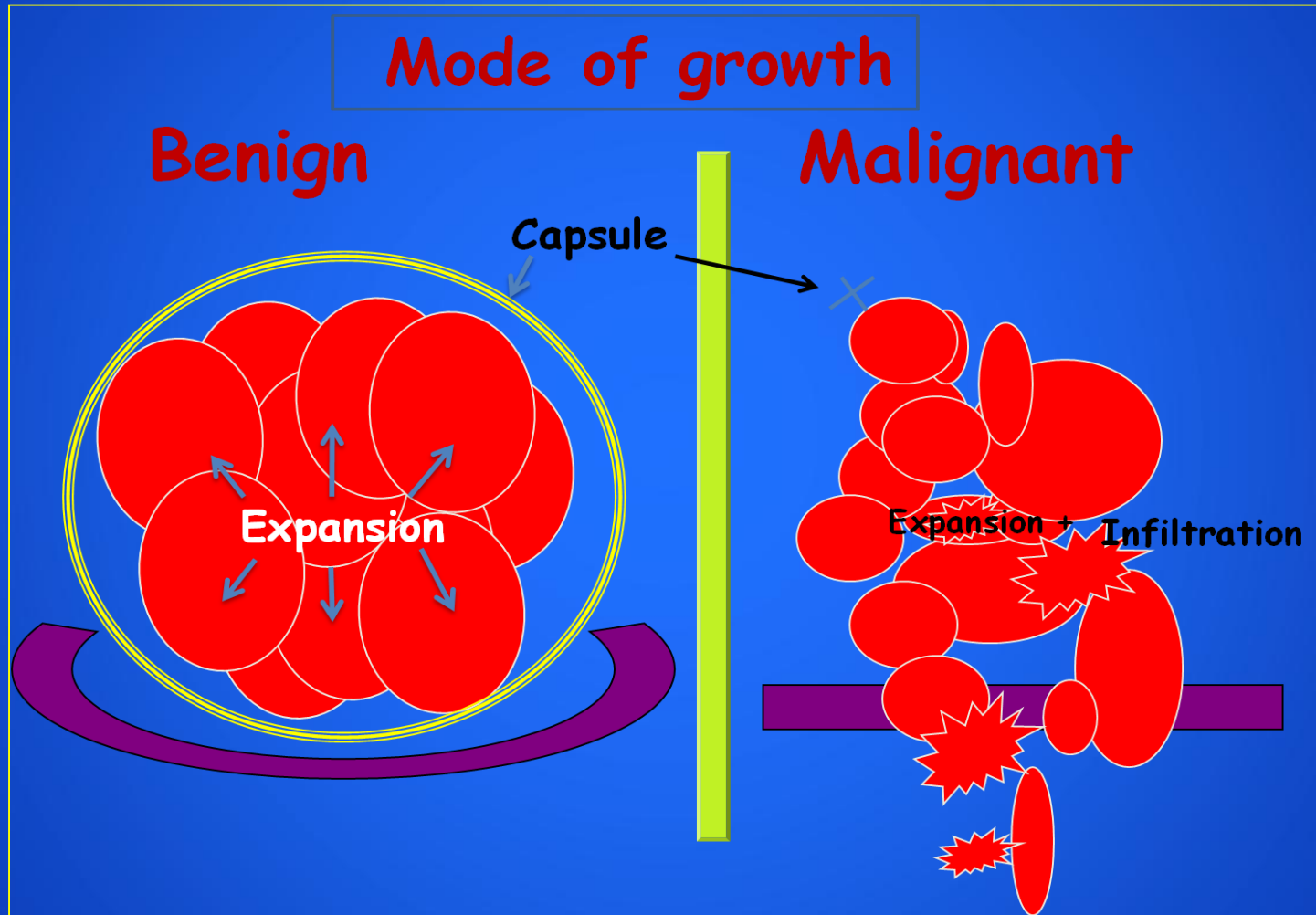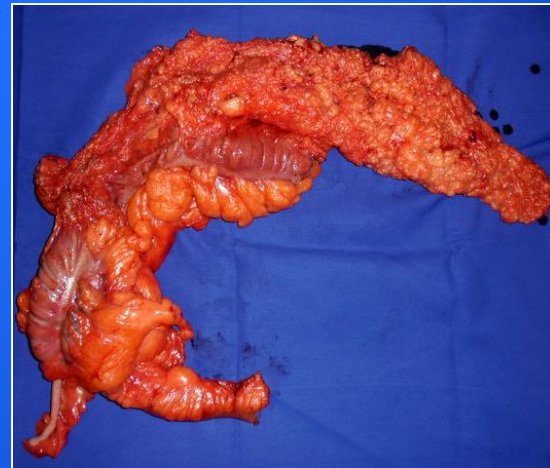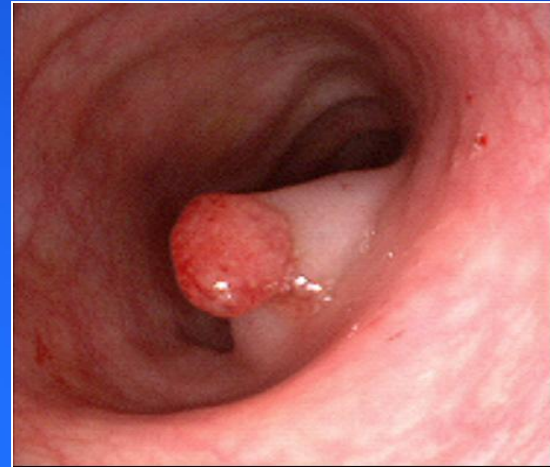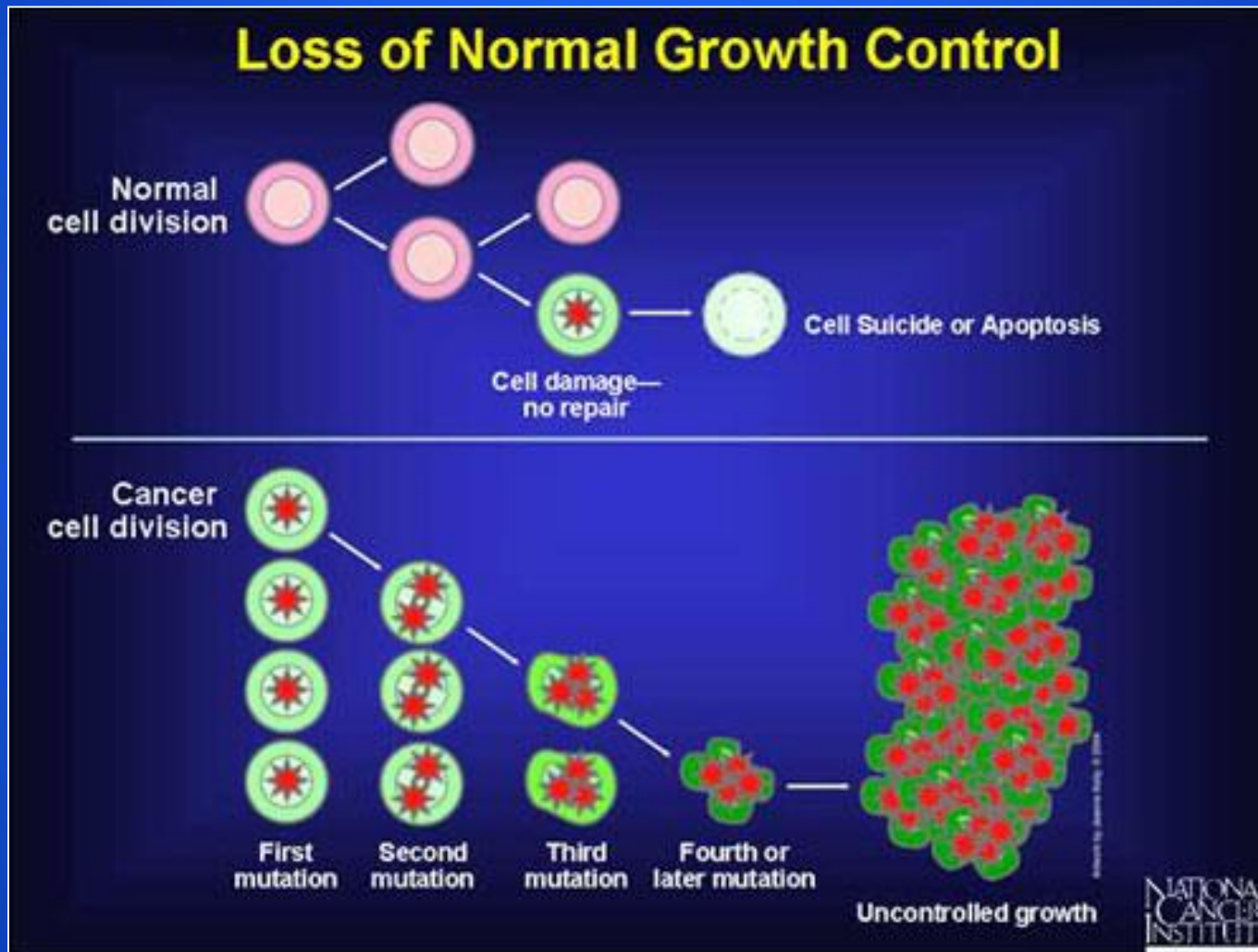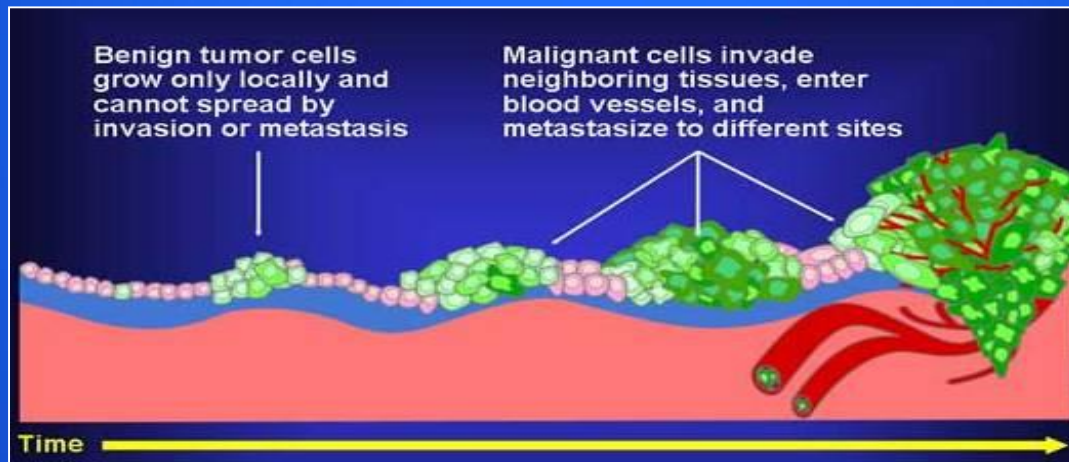Cancer cells have lost the molecules on their surface that keep the cell in its right place
They have become detached from their neighbour

Benign tumor cells grow only locally and cannot spread by invasion or metastasis

Malignant cells invade neighboring tissues, enter blood vessels, and metastasize to different sites

Time

Uncontrolled growth and loss of contact phenomenan are the main characteristics of malignant cells

Spread of Malignant Tumours

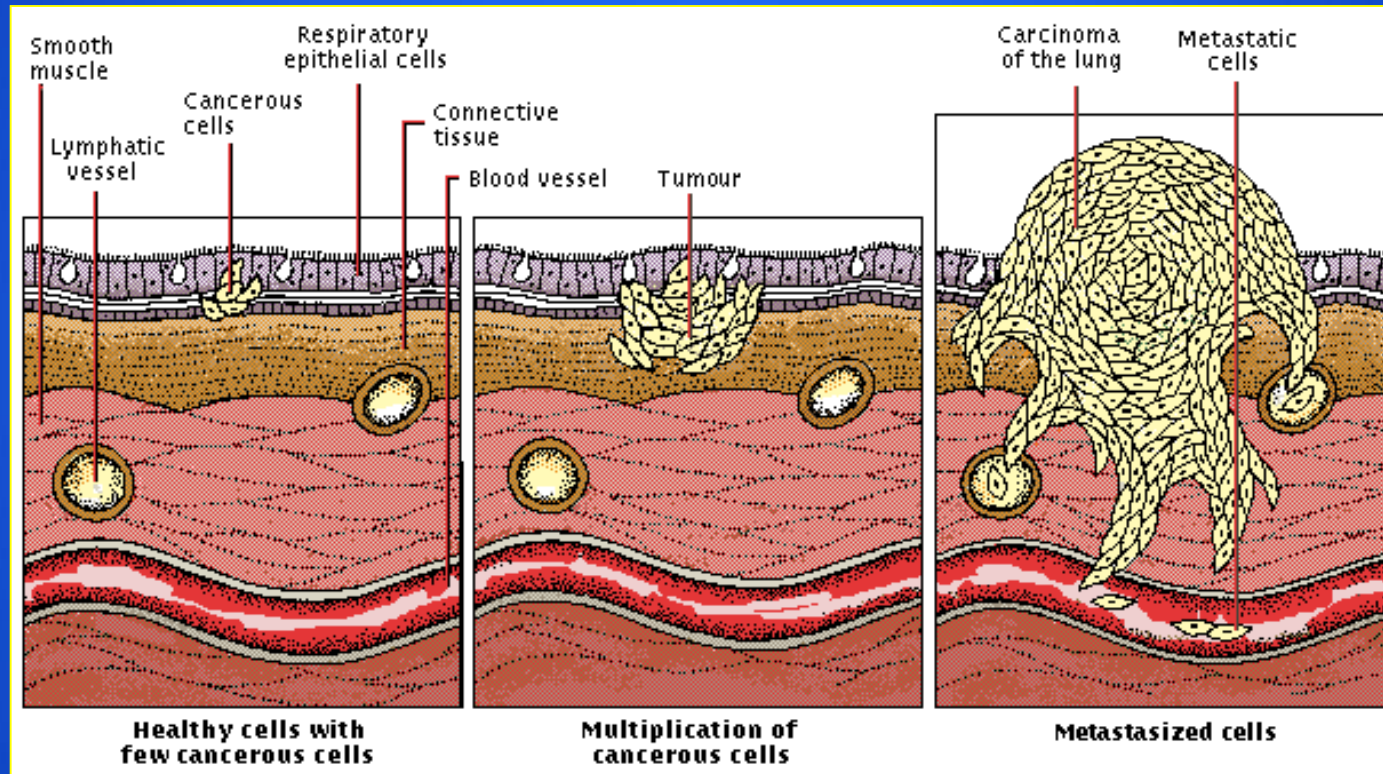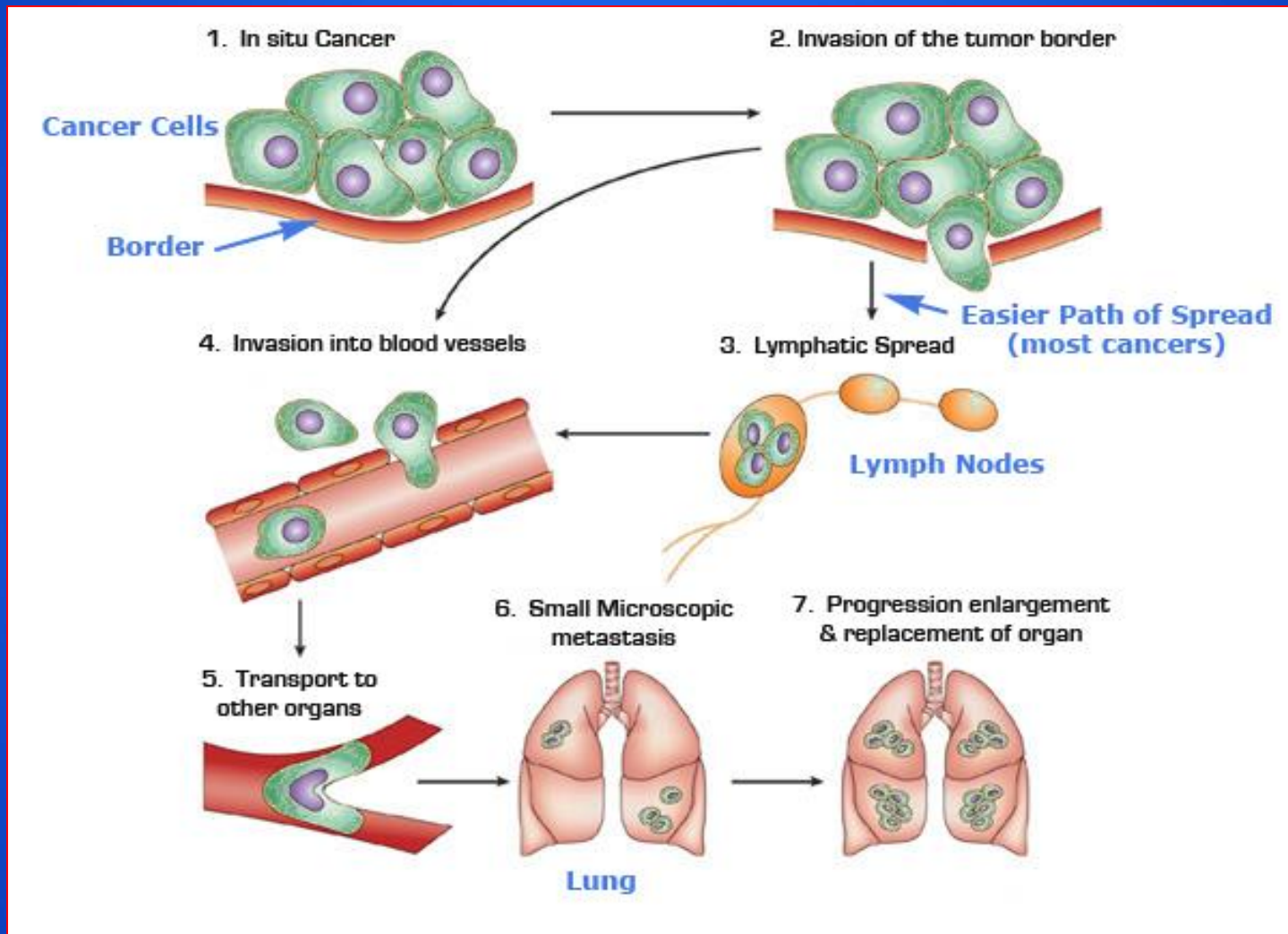Smooth muscle · Cancerous cells · Lymphatic vessel · Respiratory epithelial cells · Connective tissue · Blood vessel · Tumour · Carcinoma of the lung · Metastatic cells

Healthy cells with few cancerous cells · **Multiplication of cancerous cells** · **Metastasized cells**

Spread of Malignant tumours

Normal versus Malignant Cells
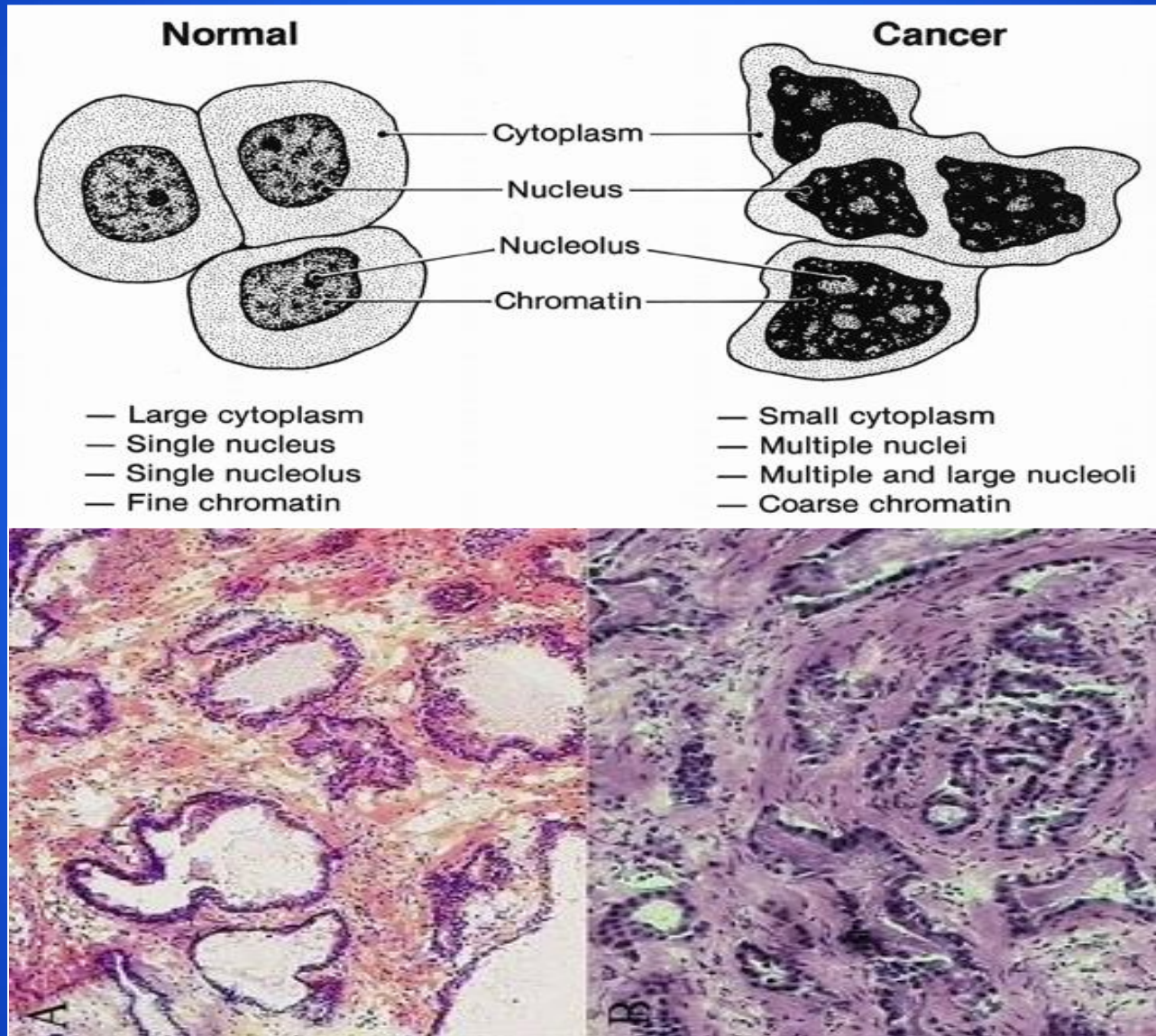
Malignant cell morphology

Large, darker staining nuclei with irregular shapes.

Normal cells with small, regular nuclei.
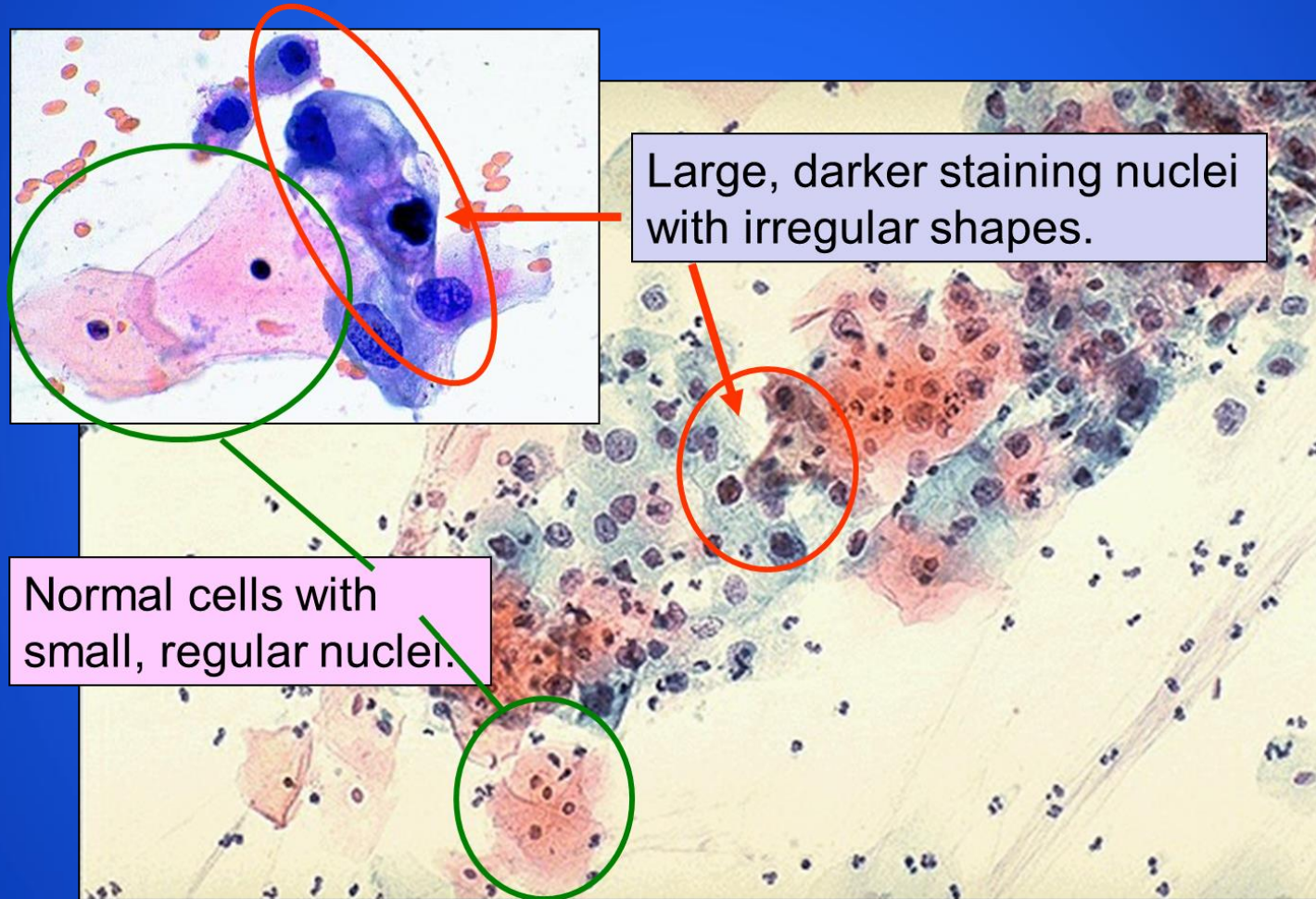
Tumor Grading & Differentiation

Grading: Describes the histologic characteristics of cancer cells mainly talk about cell layers.
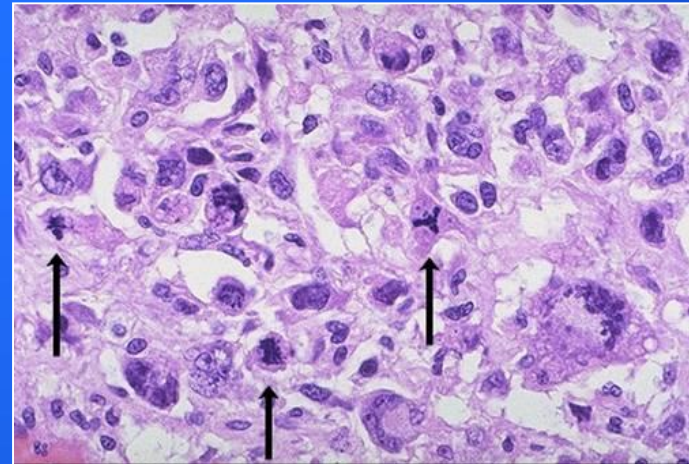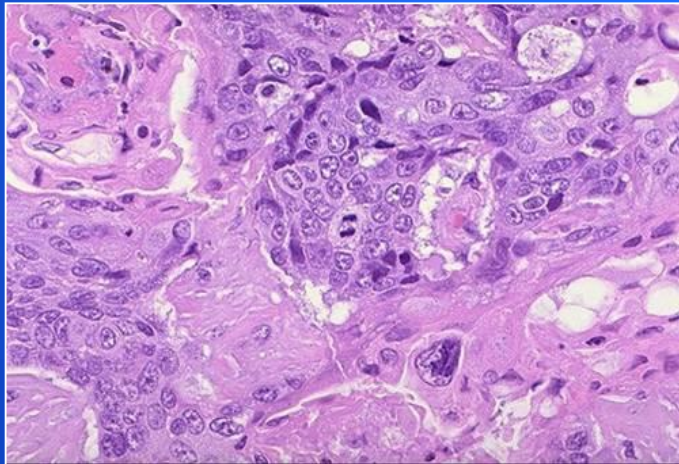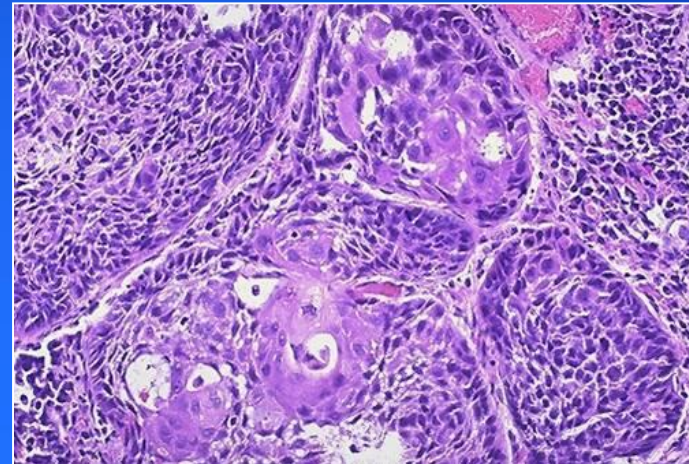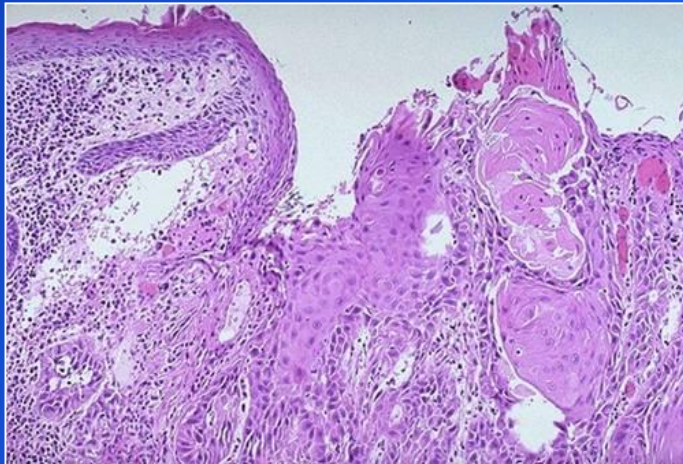
e.g. grade I, II, III.

Differentiation: Describes the characteristics of cancer cells in reference to their resemblance to the cell of origin.

e.g. well differentiated

moderately differentiated

poorly differentiated

anaplastic.

Both describe the histological features of the tumor
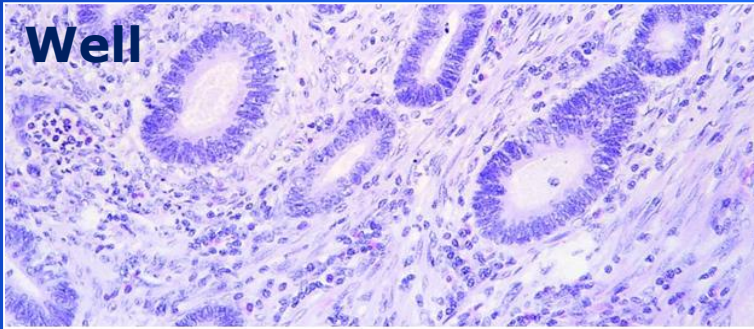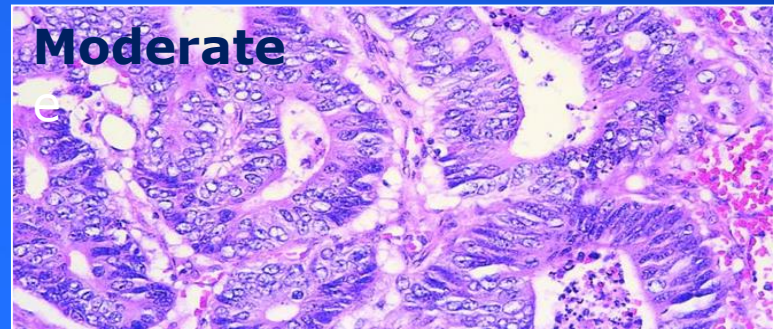
Tumor Grading & Differentiation

Tumor grading & tumor differentiation both describe the histological features of the tumor and not the macroscopic features , invasion or metastasis
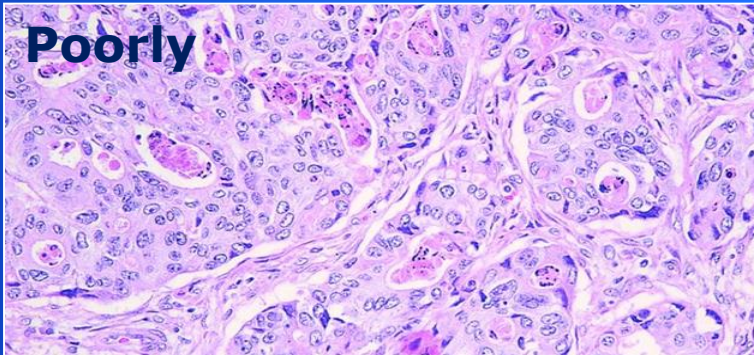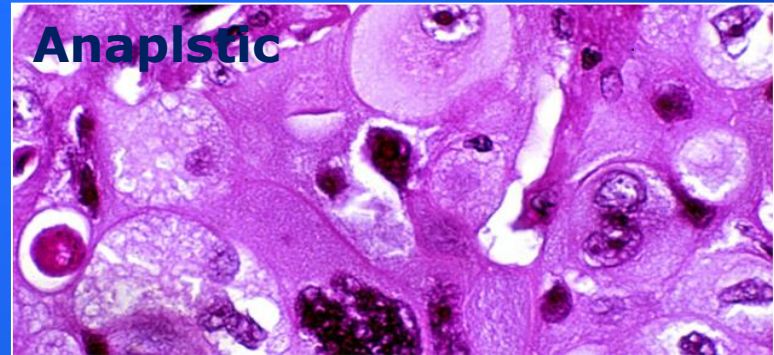
Tumor Differentiation

Well

Moderate

Poorly
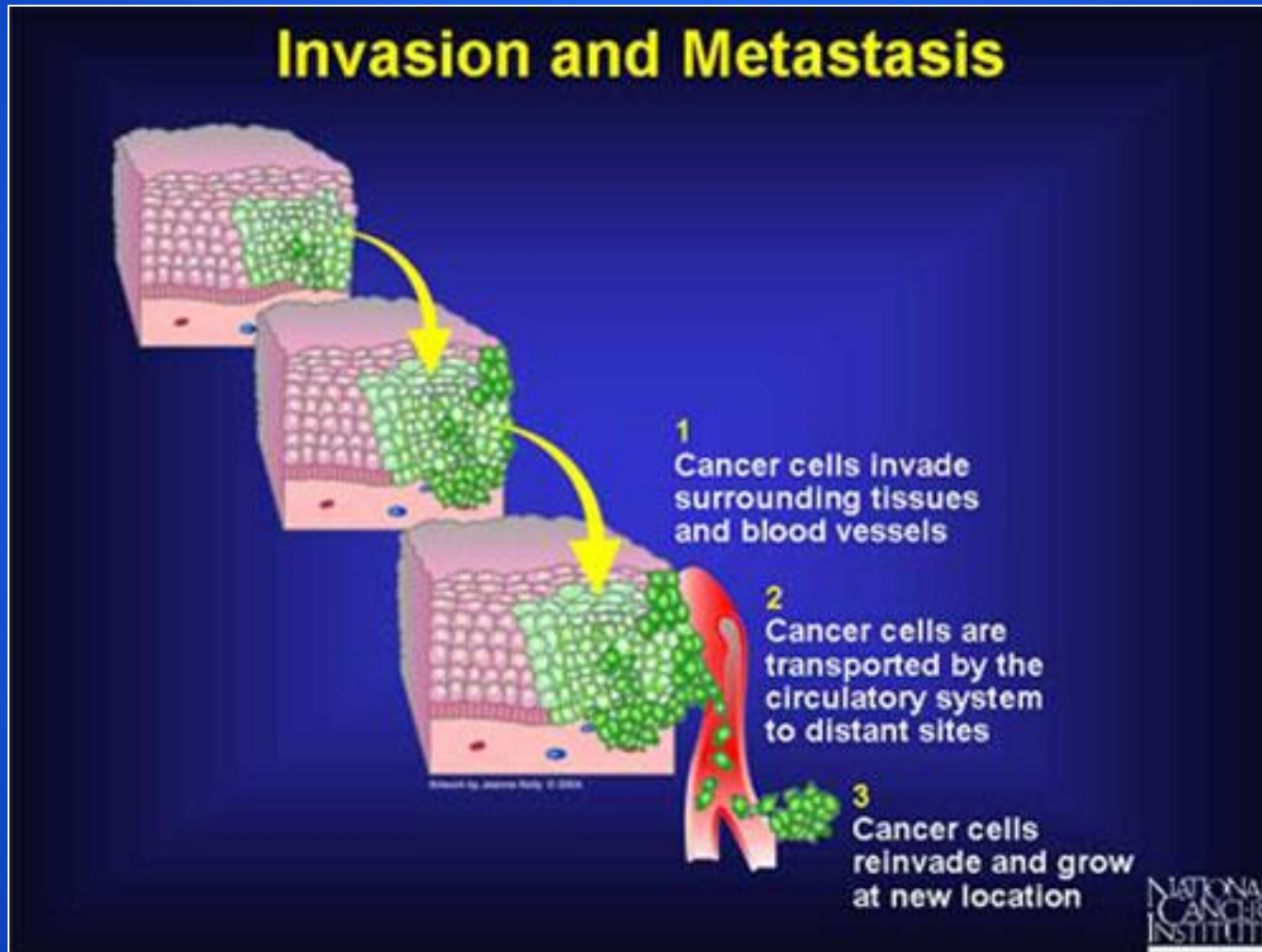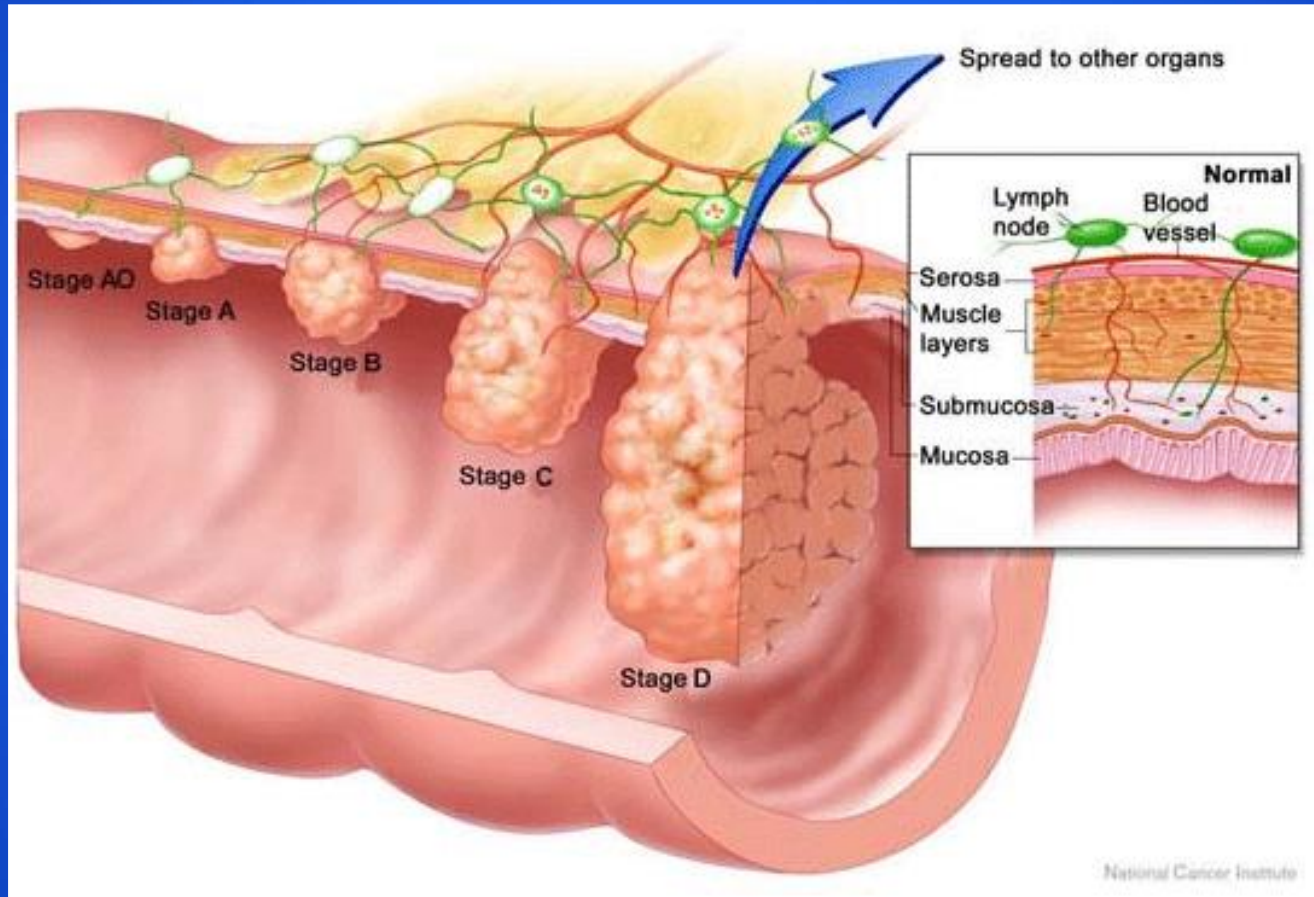

Anaplstic

Why malignant cells are dangerous
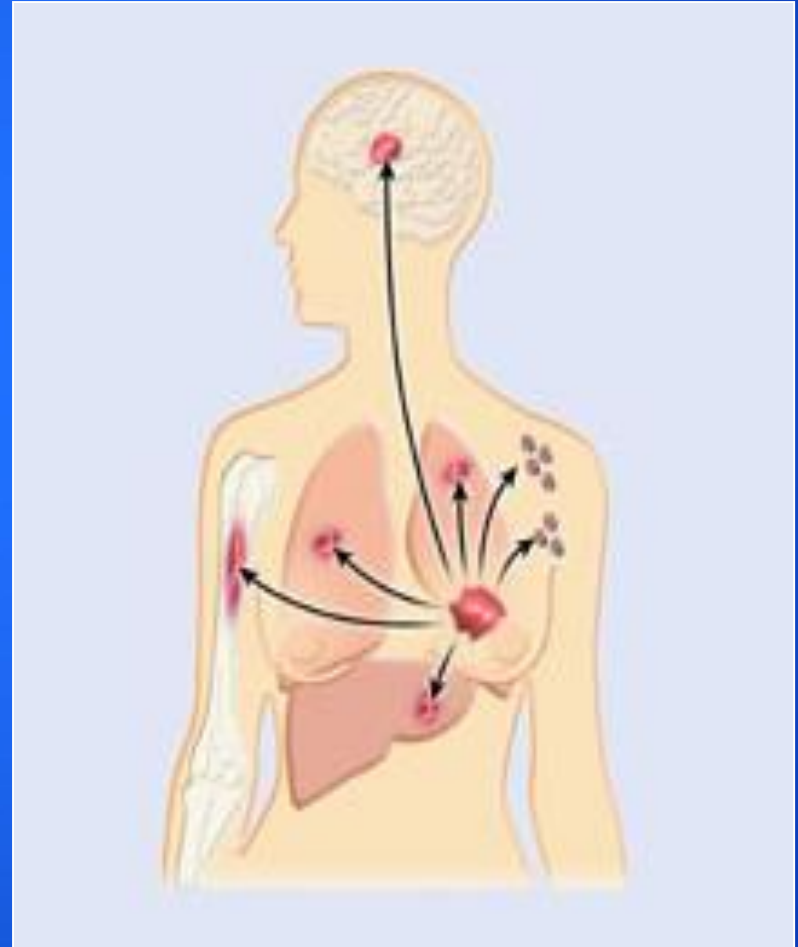
Spread Of Malignant Tumors
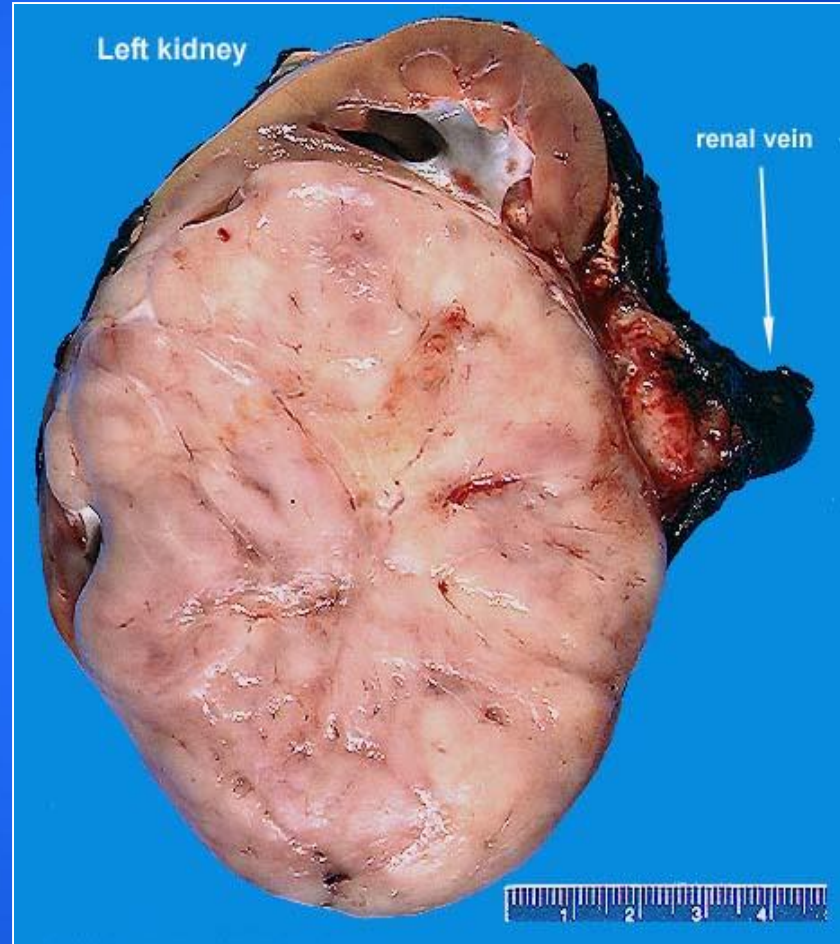
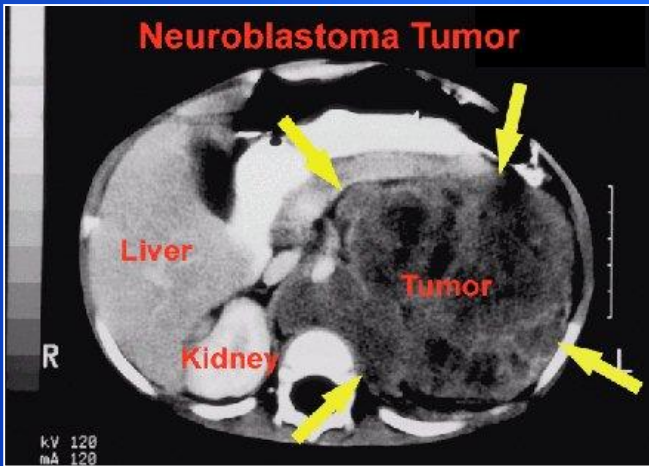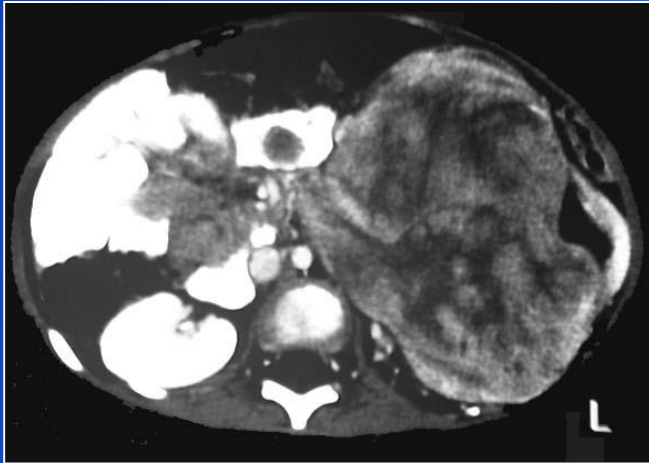# Spread of Malignant Tumor

Local invasion :

- within the organ
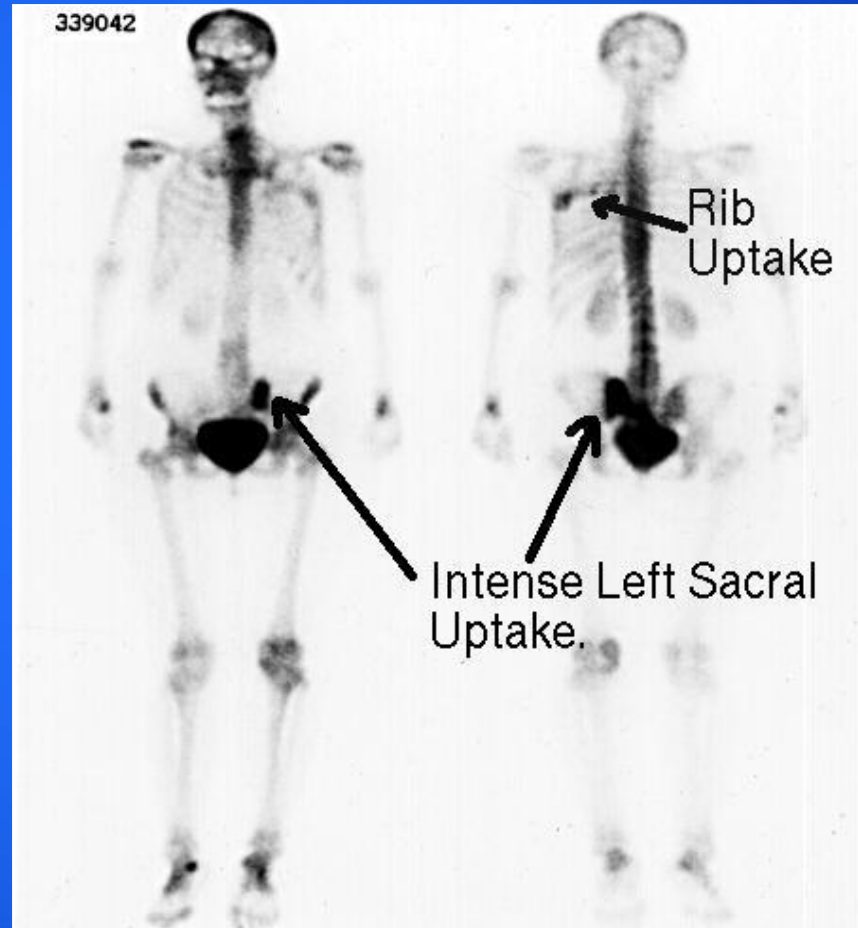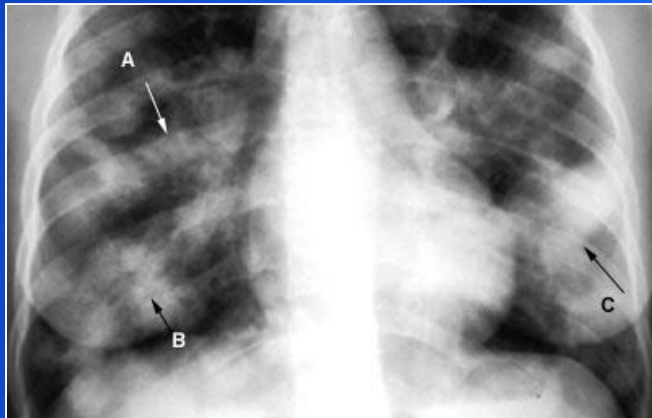- adjacent organs

Metastasis :

- Lymphatic : Regional & distant lymph nodes.
- Haematogenous e.g. liver, lung, bones.
- Transcoelomic e.g peritoneal & pleural cavity.
- Implantation e.g. needle tracks, wounds.

Local Invasion

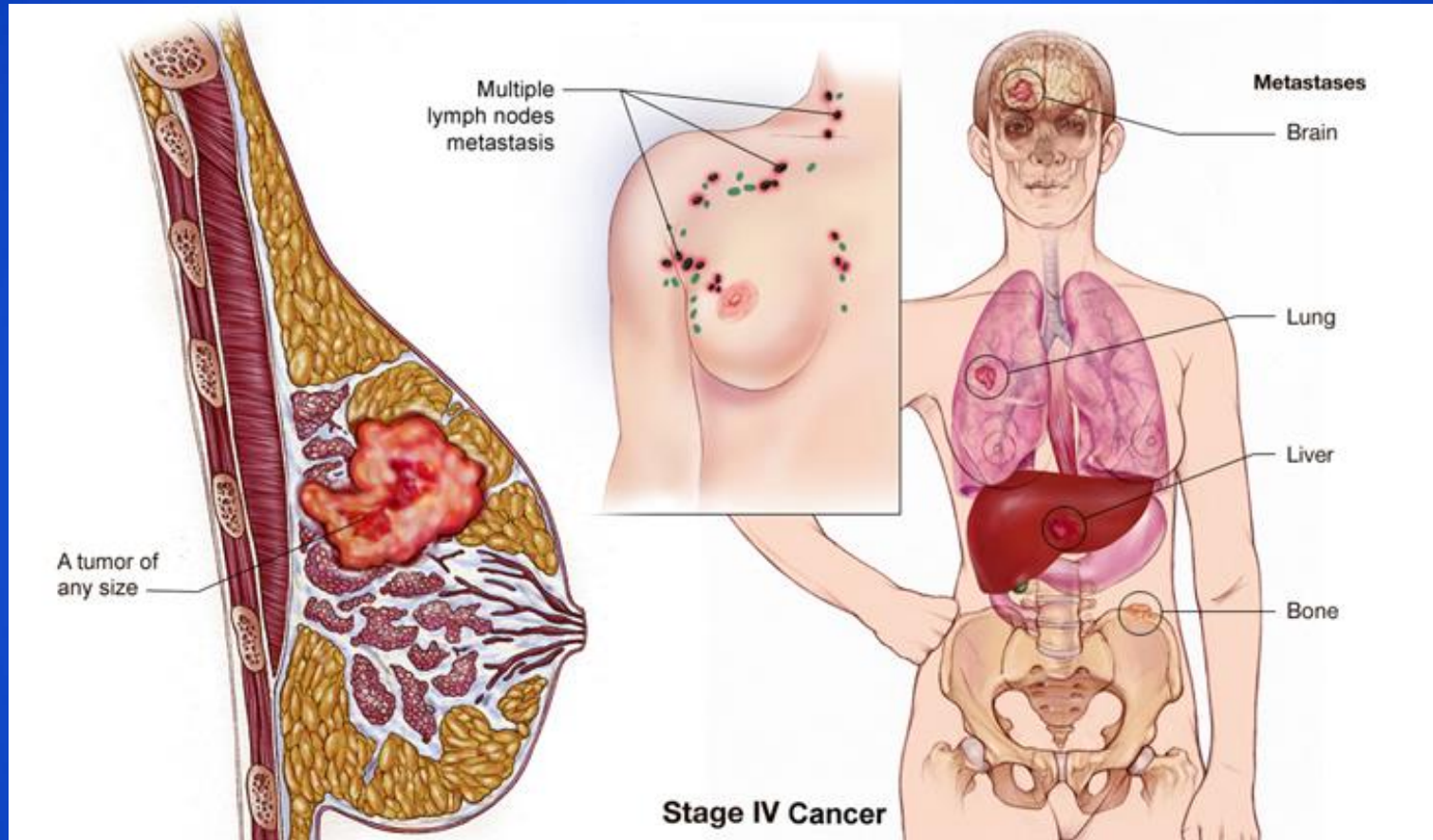

Neuroblastoma Tumor
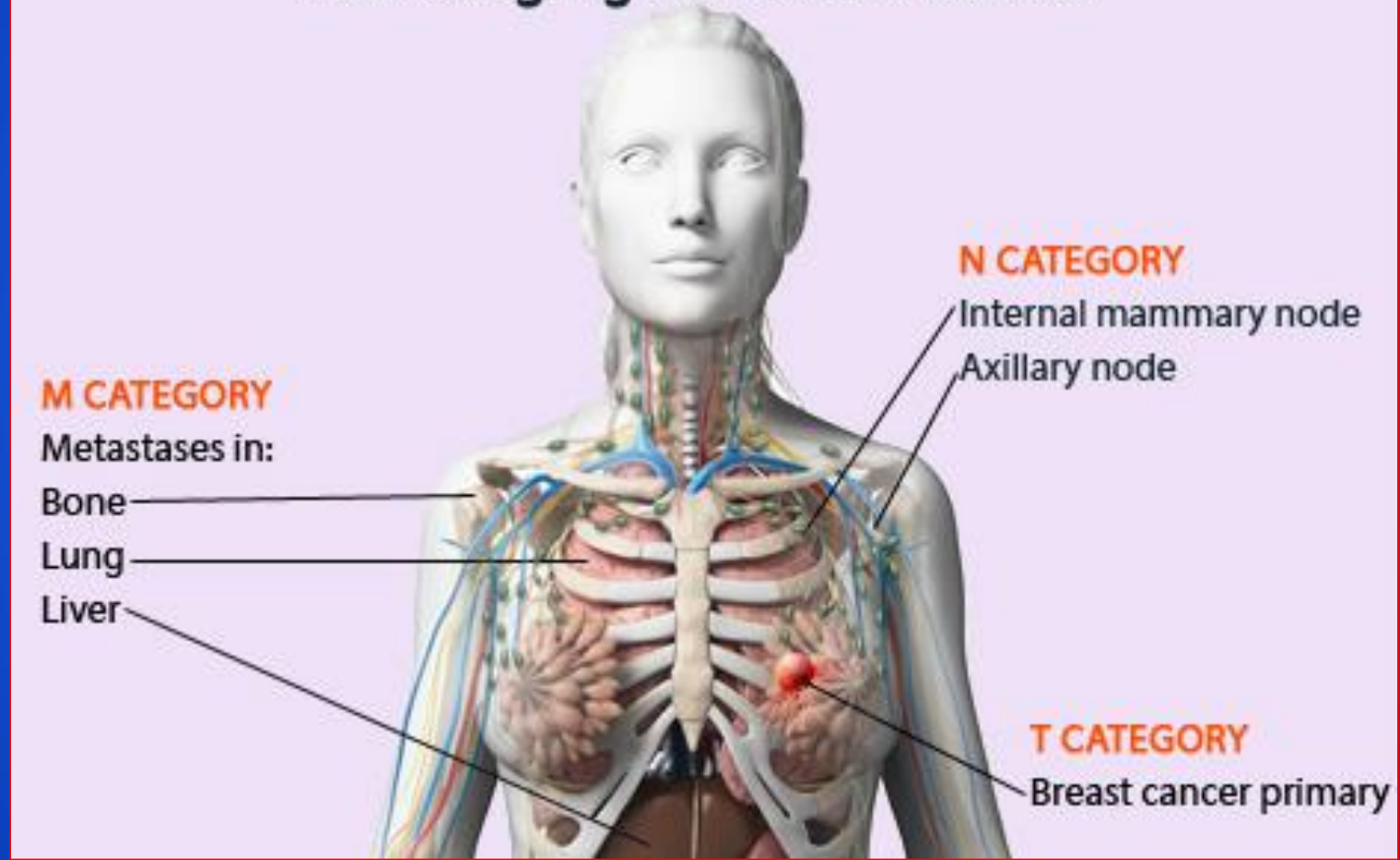Liver
Tumor
Kidney

Left kidney
renal vein

Distant Metastasis

STAGING OF MALIGNANT TUMORS

Stage IV Cancer

Staging describes the primary tumor, its relation with the organ of origin ,adjacent and distant organs

TNM Classification

TNM Staging for Breast Cancer

N CATEGORY
Internal mammary node
Axillary node

M CATEGORY
Metastases in:
Bone
Lung
Liver

T CATEGORY
Breast cancer primary

Types of Tumor Staging

Classical: e.g. stage I, II, III, IV
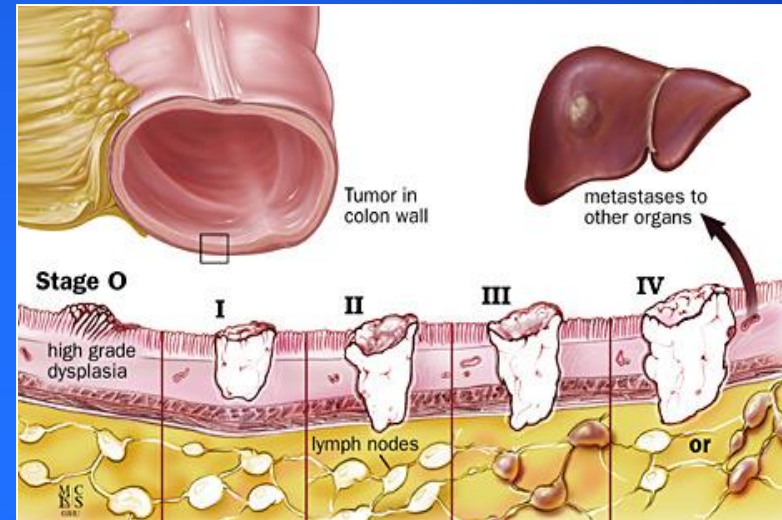**TNM:e.g**
T1, No, Mo
T – Tumor :
T1,2,3, Tis, Ta, Tb
N – Node :
N0, 1, 2, 3
M – Metastasis:
M0,1,2,3

TNM Classification (American Joint Commission on Cancer)				Dukes' Classification
Stages	T	N	M	Stages
Stage 0	Tis	N0	M0	
Stage I	T1	N0	M0	A
	T2	N0	M0	B1
Stage II	T3	N0	M0	B2
	T4	N0	M0	B2
Stage III	T1, T2	N1 or N2	M0	C1
	T3, T4	N1 or N2	M0	C2
Stage IV	Any T	Any N	M1	D

Why Do We Stage Malignant Tumors?

- **To decide the treatment**
- **To plan the treatment**
- **To assess the prognosis**

Whenever you deal with malignant tumor, always remember that there is primary tumor & there may be secondaries.

Presentation of Malignant Tumors

- Asymptomatic

- Symptoms related to the primary

- Symptoms related to the secondaries

- Incidental finding

- Weight loss and Cachaxia are late manifestations of most malignant tumors except GI and Lung cancer

Presentation of Malignant Tumors
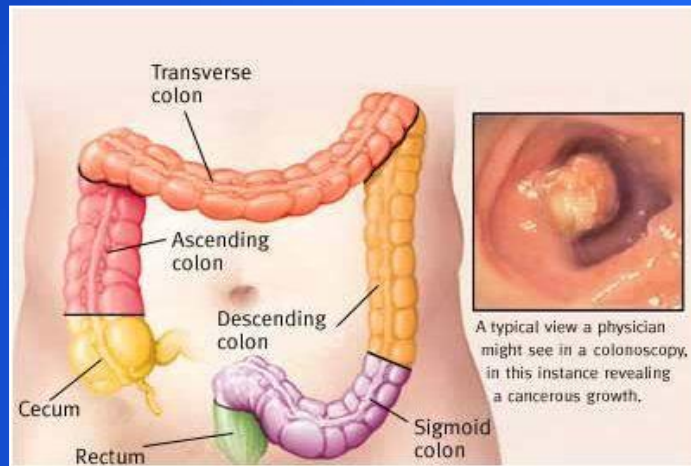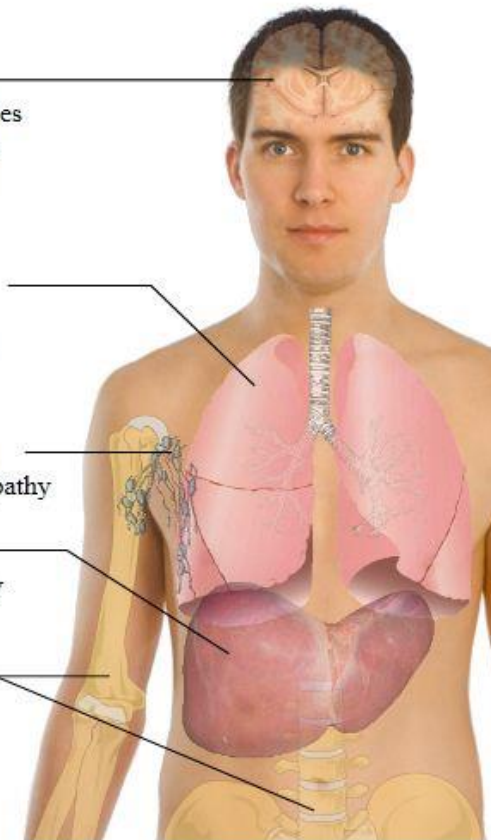
Investigation of Malignant Tumors
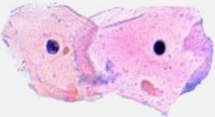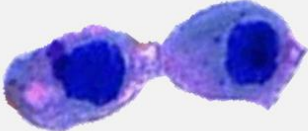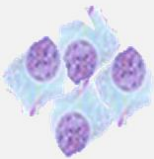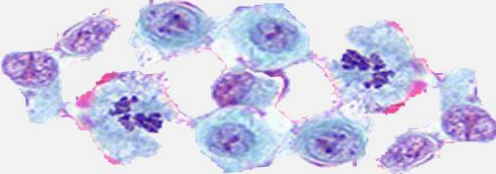
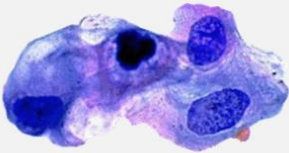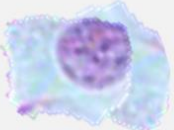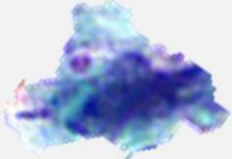- **Investigate for the primary**
  - Depends on the site
  - Define the histology
  - Define the local extension
- **Investigate for the secondaries**
  - Look for metastasis
  - Usually liver, lung and bones
- **Both will define the diagnosis & stage**
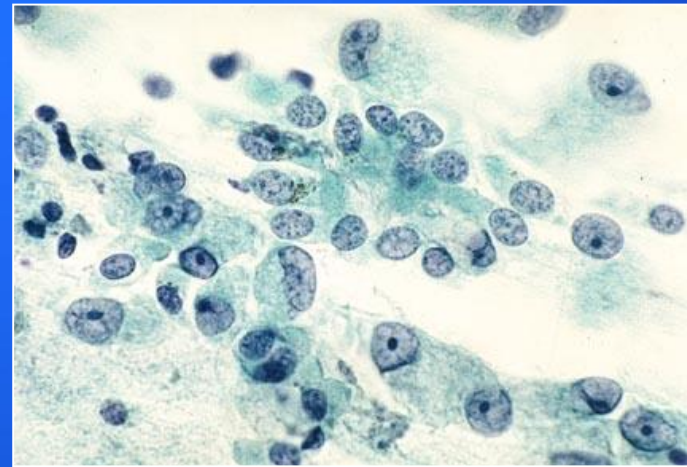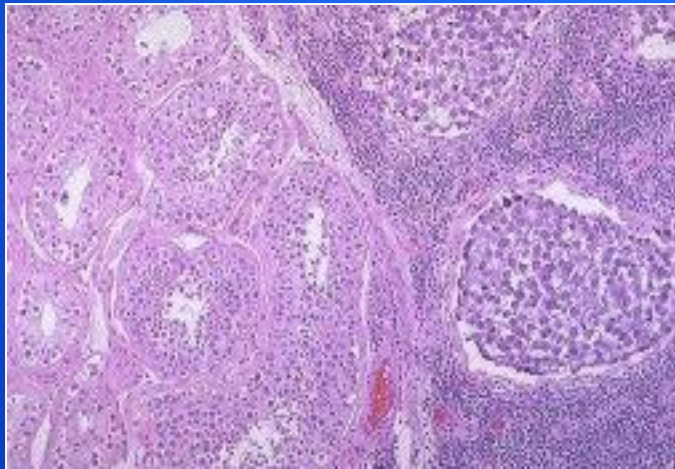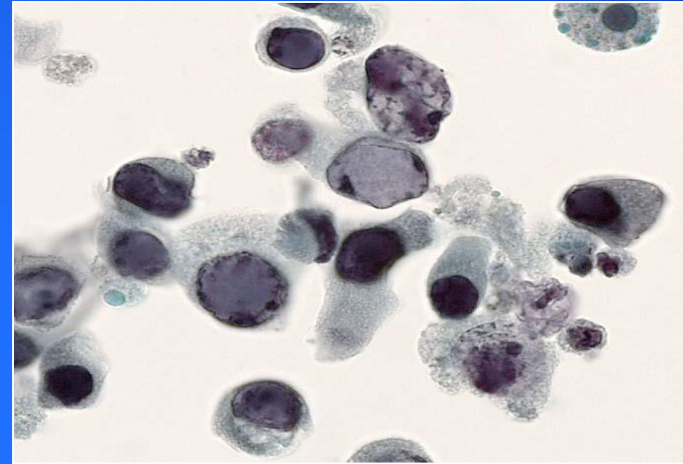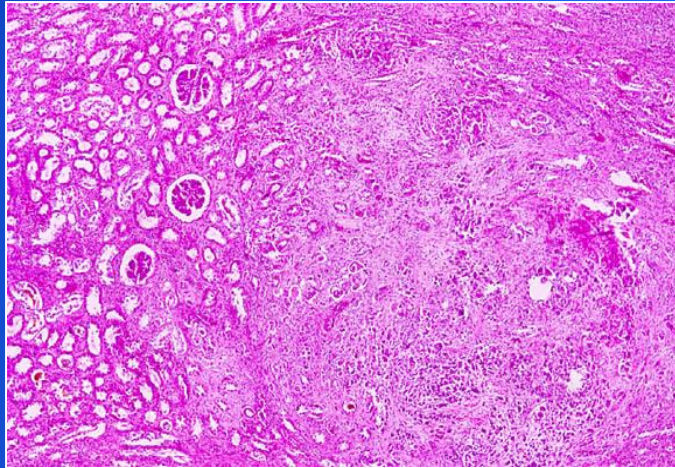
Investigation of Malignant Tumors
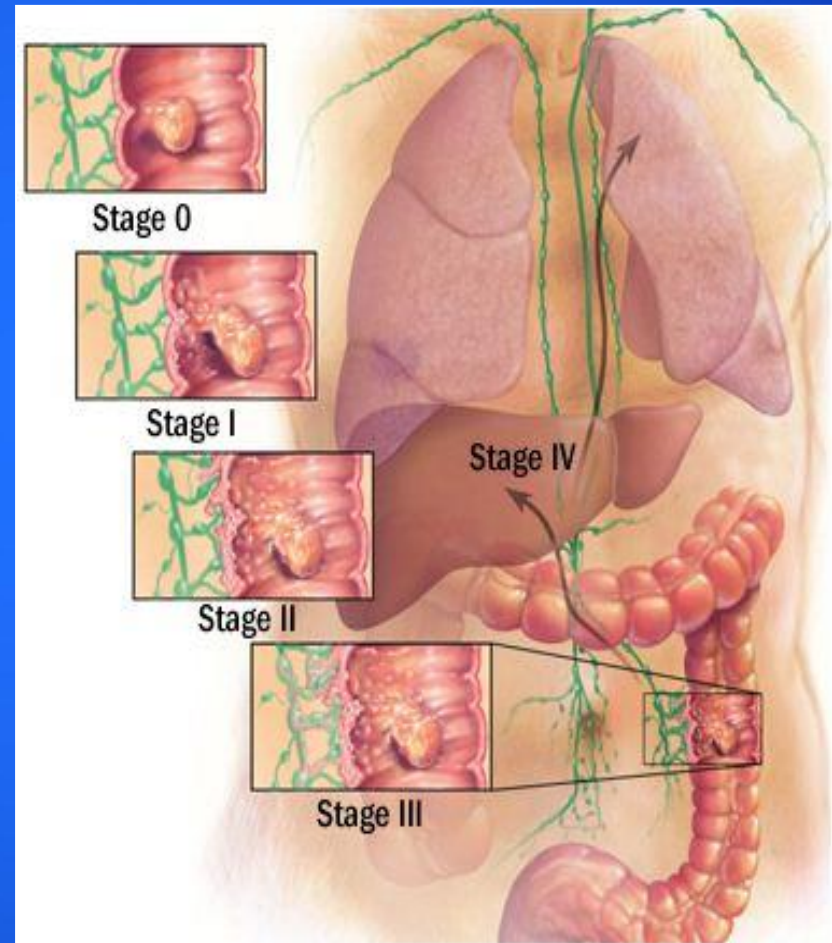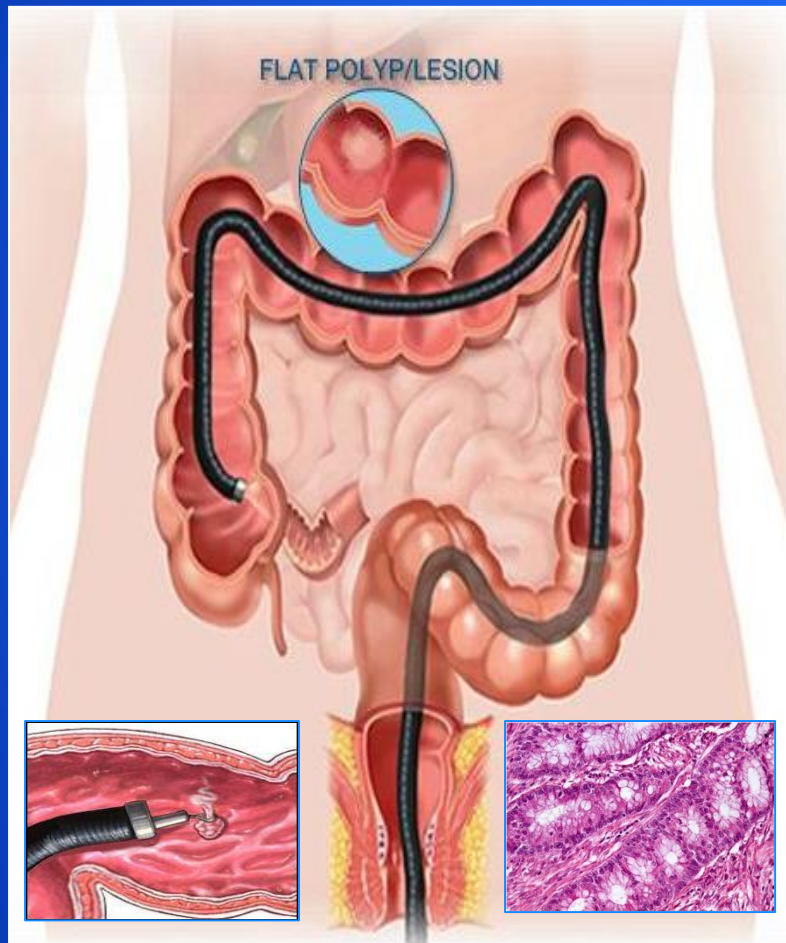
Principles of Cytology

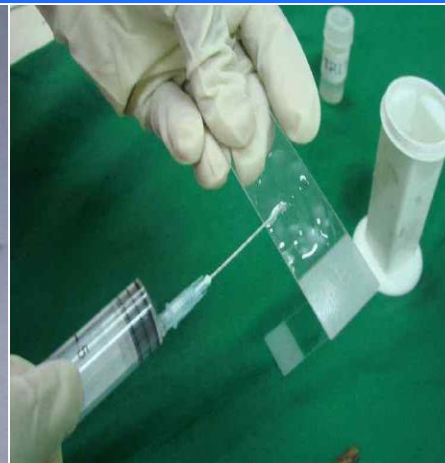| Normal	Cancer	
		Large, variably shaped nuclei
		Many dividing cells; Disorganized arrangement
		Variation in size and shape
		Loss of normal features

Biopsy

Cytology

How we obtain material for histology

- **Cytology** : **morphology of individual cells.**
  - **Exfoliative (urine,sputum,....)**
  - **Fluid aspiration (ascitic fluid,pleural fluid)**
  - **Fine needle aspiration (FNA)**

- **Biopsy** : **histological (tissue) characteristics**
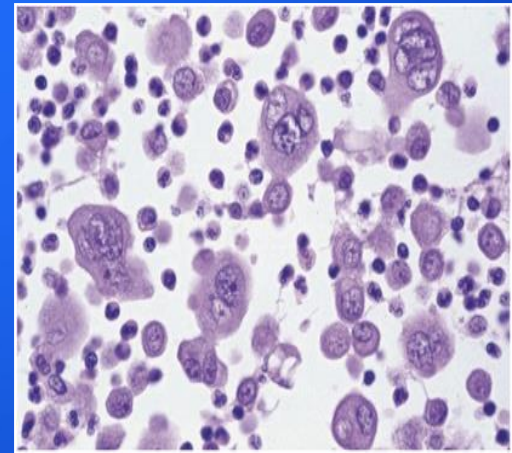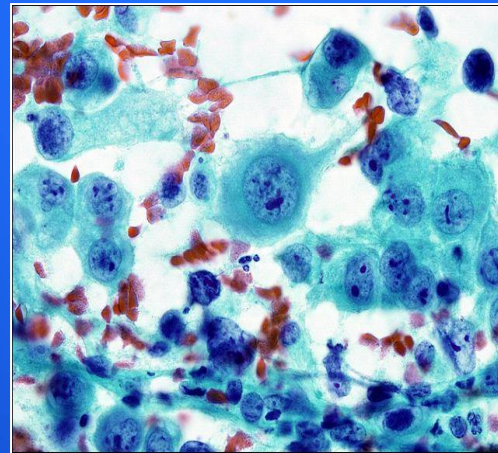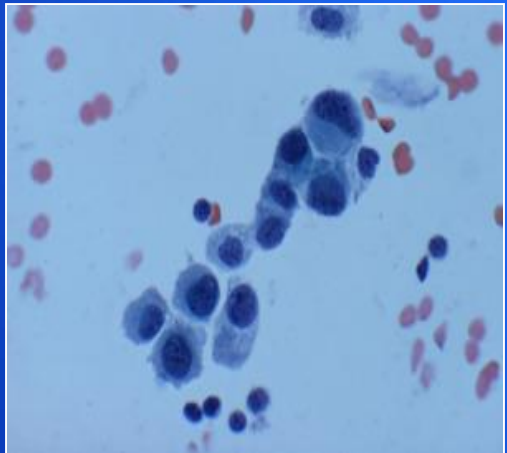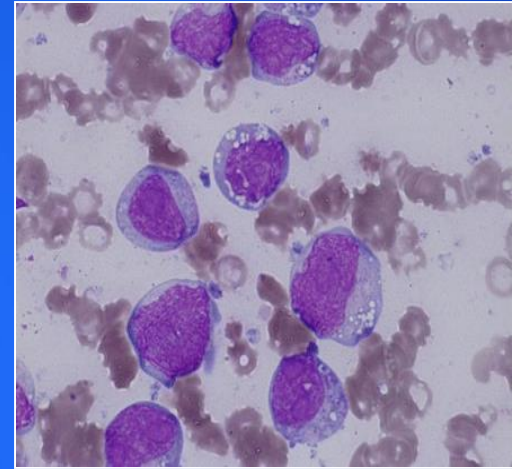 - **Incisional biopsy (open, needle, forceps..)**
  - **Excisional biopsy**

Cytology

Cytology : Examples

carcinoma

Tissue Biopsy

PRINCIPLE OF TRUCUT BIOPSY

SHEATH

LESION

NEEDLE WITH SLOT FOR SPECIMEN

PUSH NEEDLE INTO LESION

SLIDE SHEATH OVER NEEDLE TO CUT SPECIMEN

WITHDRAW NEEDLE, SHEATH AND SPECIMEN
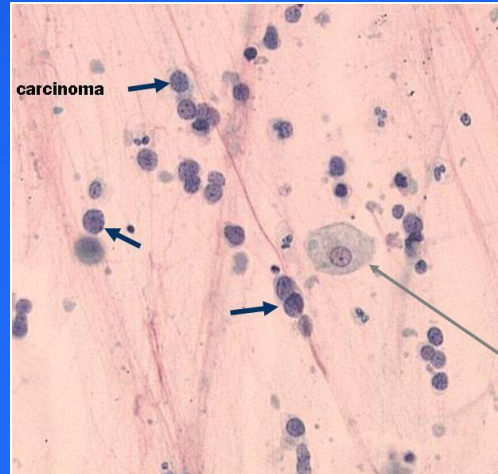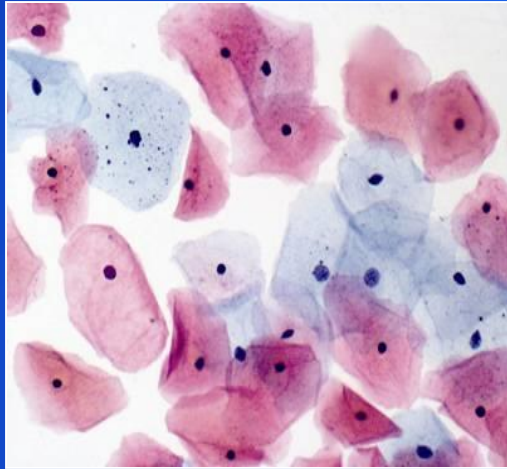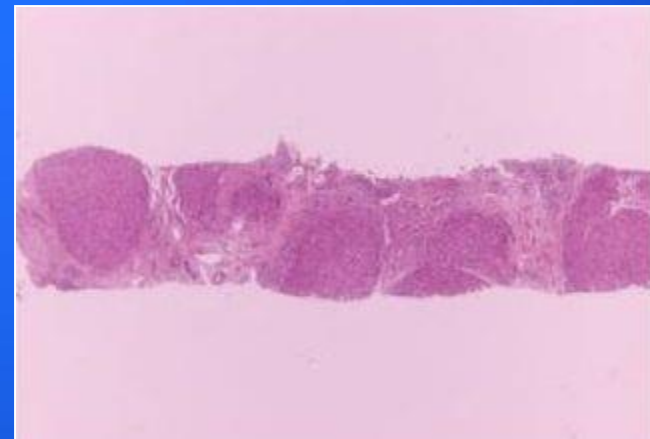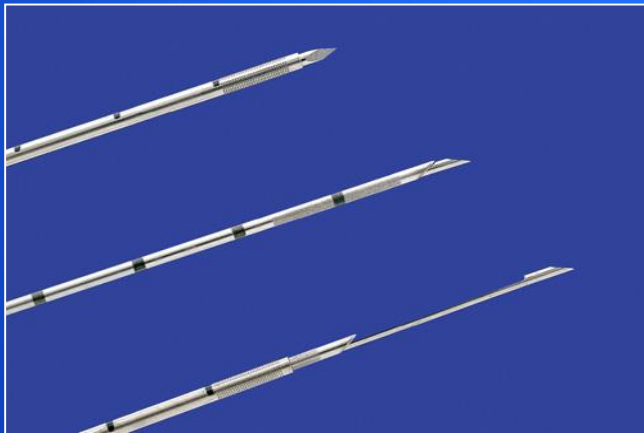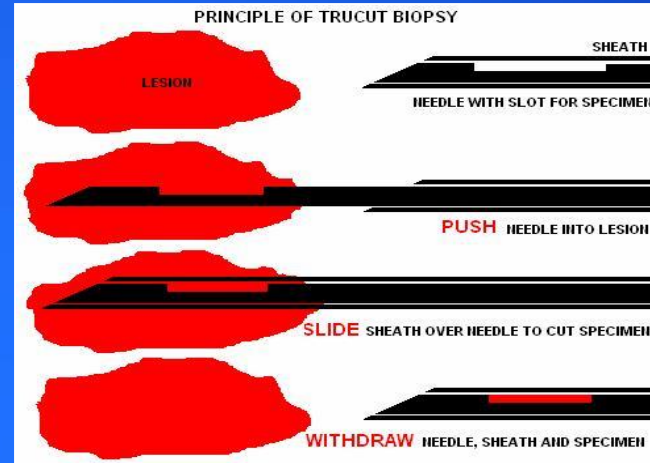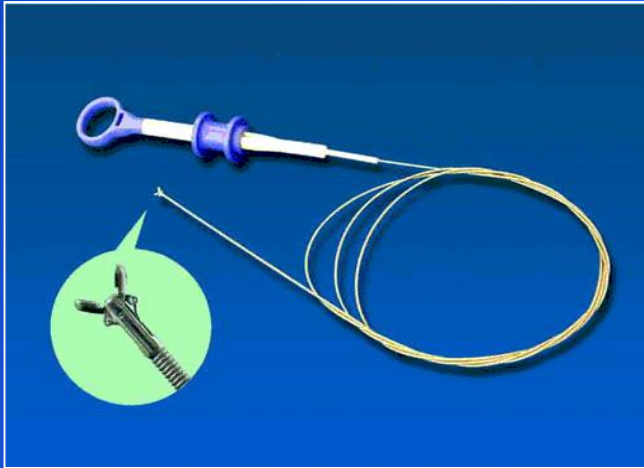
CT- guided Trucut needle biopsy
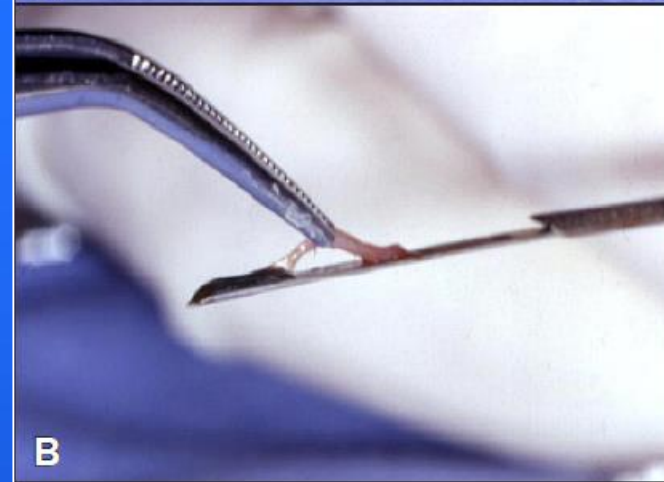
Excisional & Incisional Biopsy

Tumor Markers

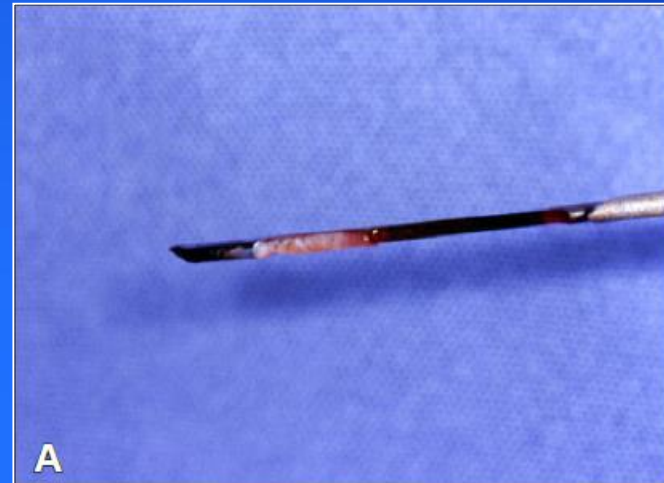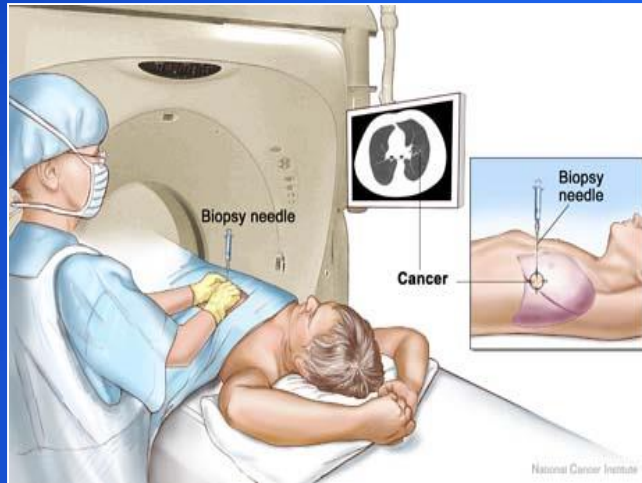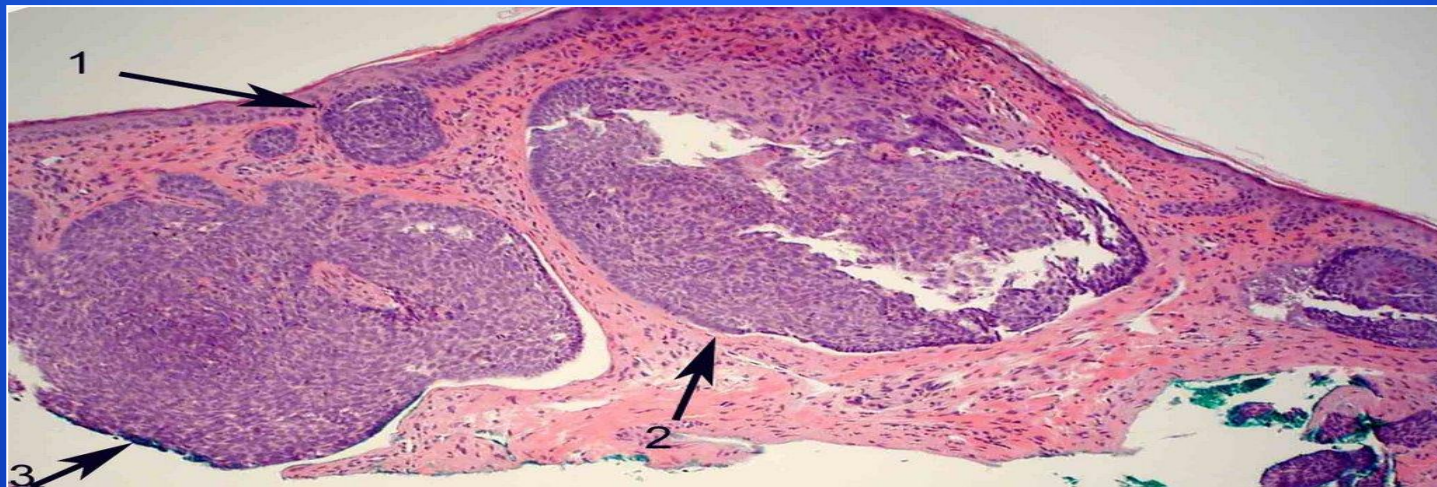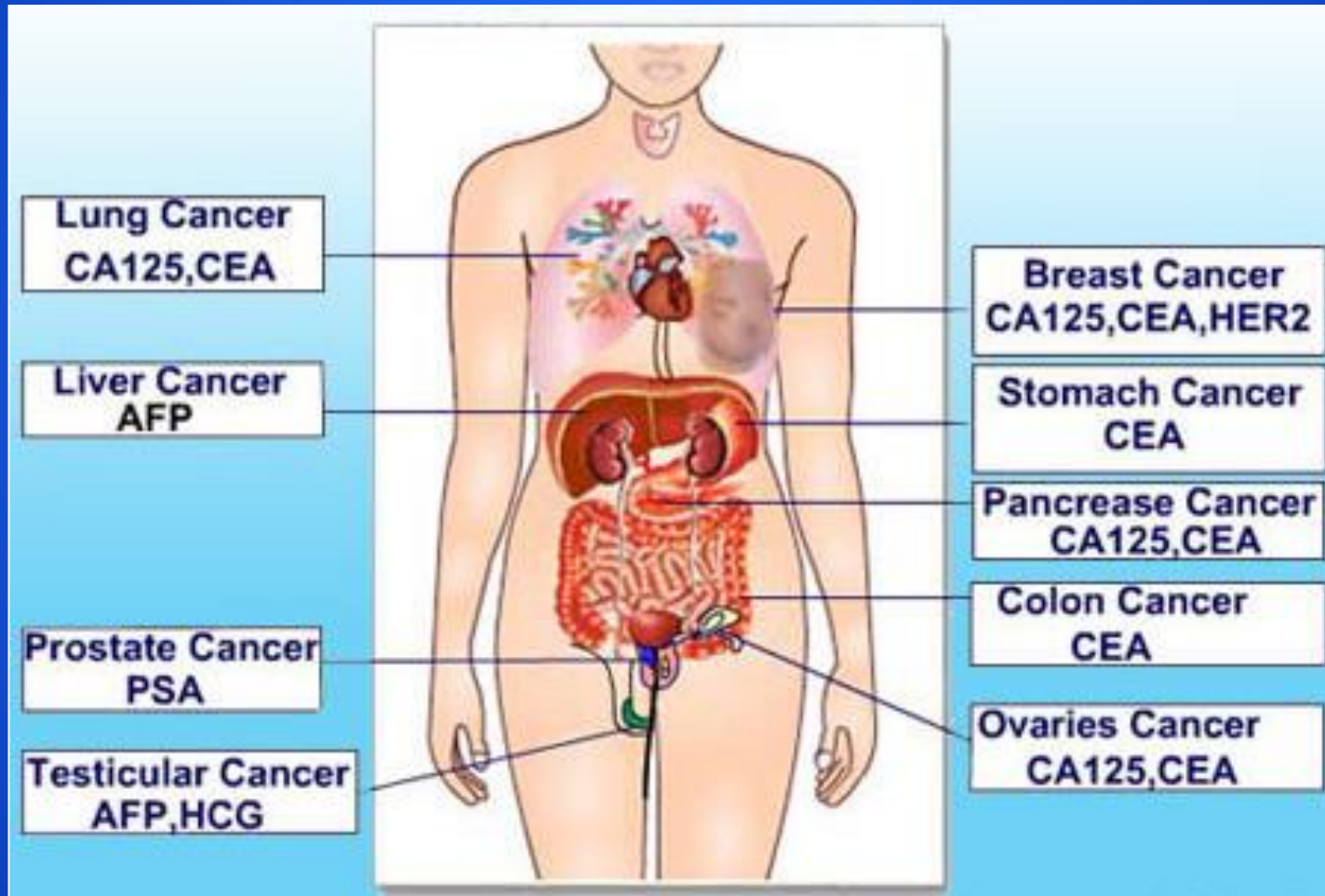- **Substances which if present in the blood or tissues may indicate malignancy.**
- **The concept is very important**
- **There are many tumor markers**
- **Most are non-specific**
- **Important in diagnosis**
- **Important for screening**
- **Important in follow up**

Tumor Markers-examples

Lung Cancer
CA125,CEA

Liver Cancer
AFP

Prostate Cancer
PSA

Testicular Cancer
AFP,HCG

Breast Cancer
CA125,CEA,HER2

Stomach Cancer
CEA

Pancrease Cancer
CA125,CEA

Colon Cancer
CEA

Ovaries Cancer
CA125,CEA

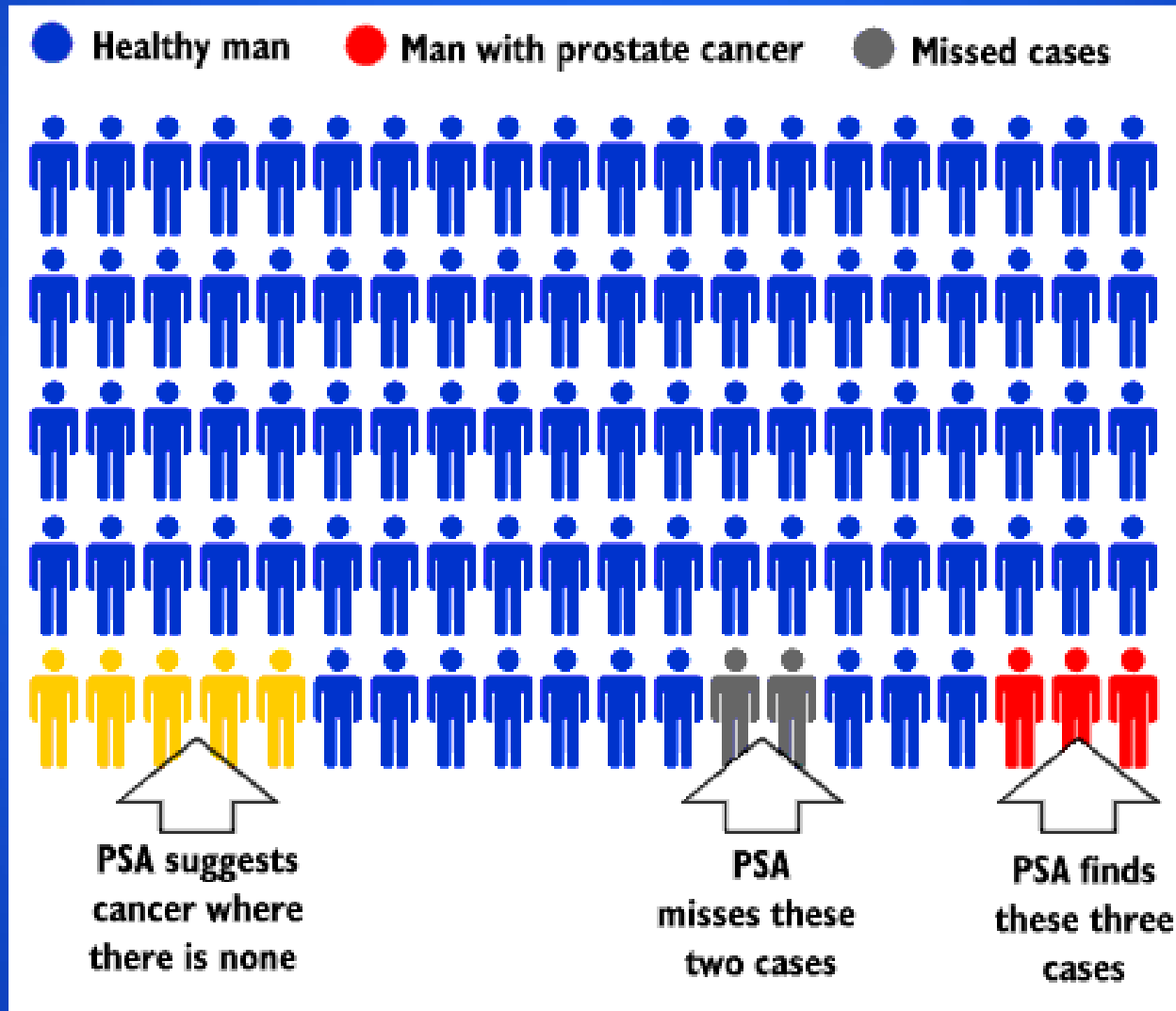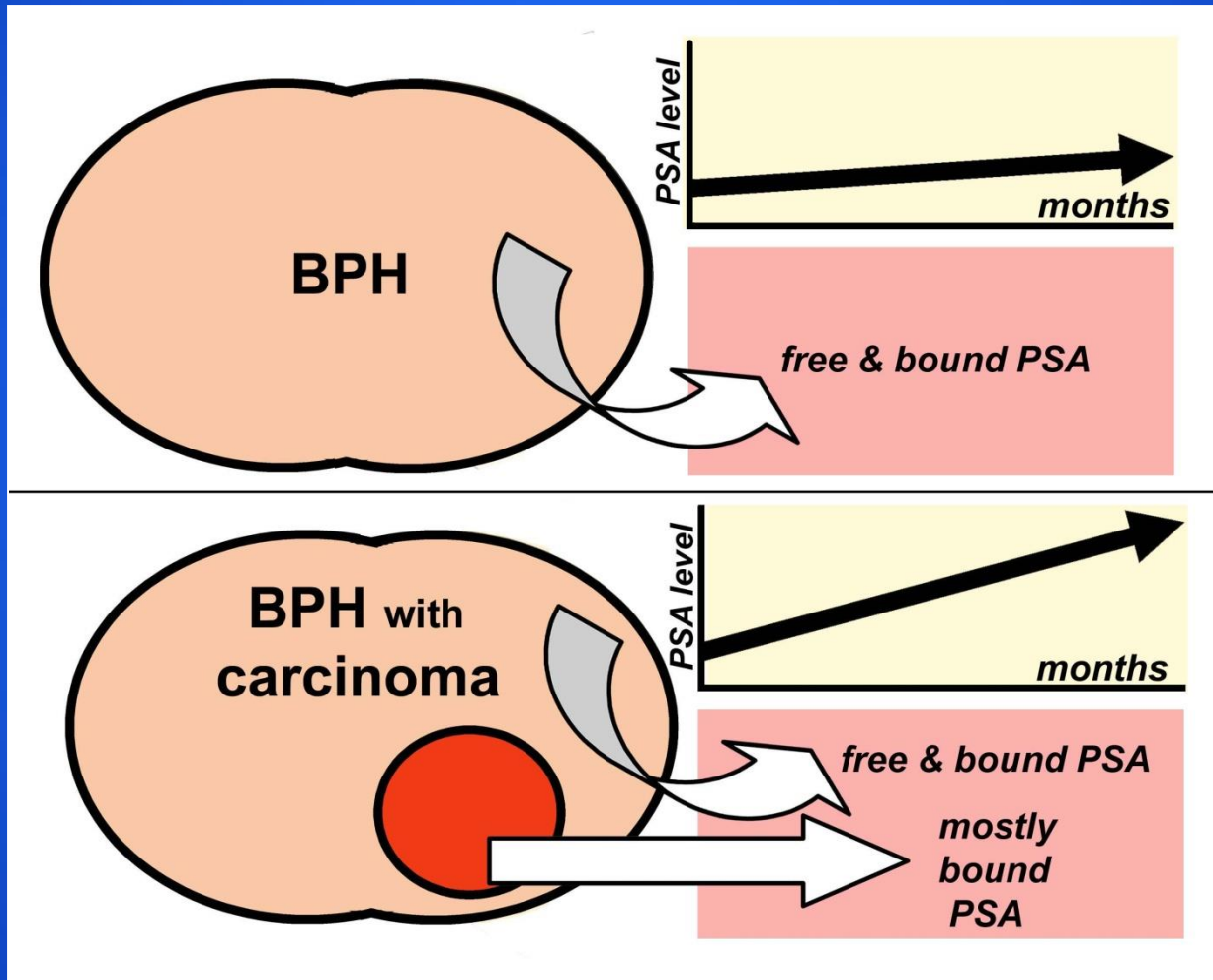# Tumor Markers in tissues
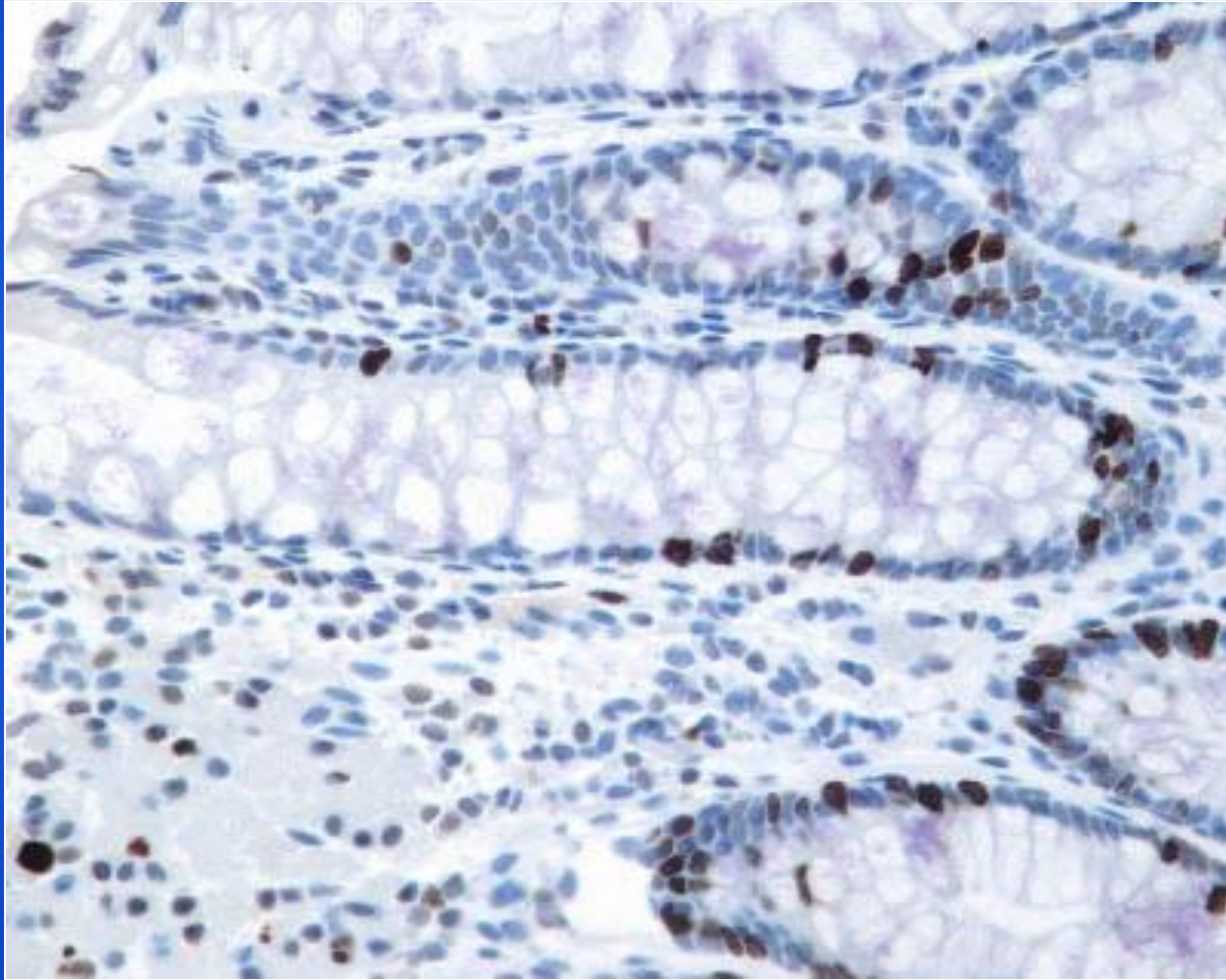
Tumor Markers-non specific

Tumor Markers-screening

Tumor Markers-diagnosis

Increase Specificity Using PSA Velocity[8]

Metastatic Cancer
Local Cancer
BPH patients
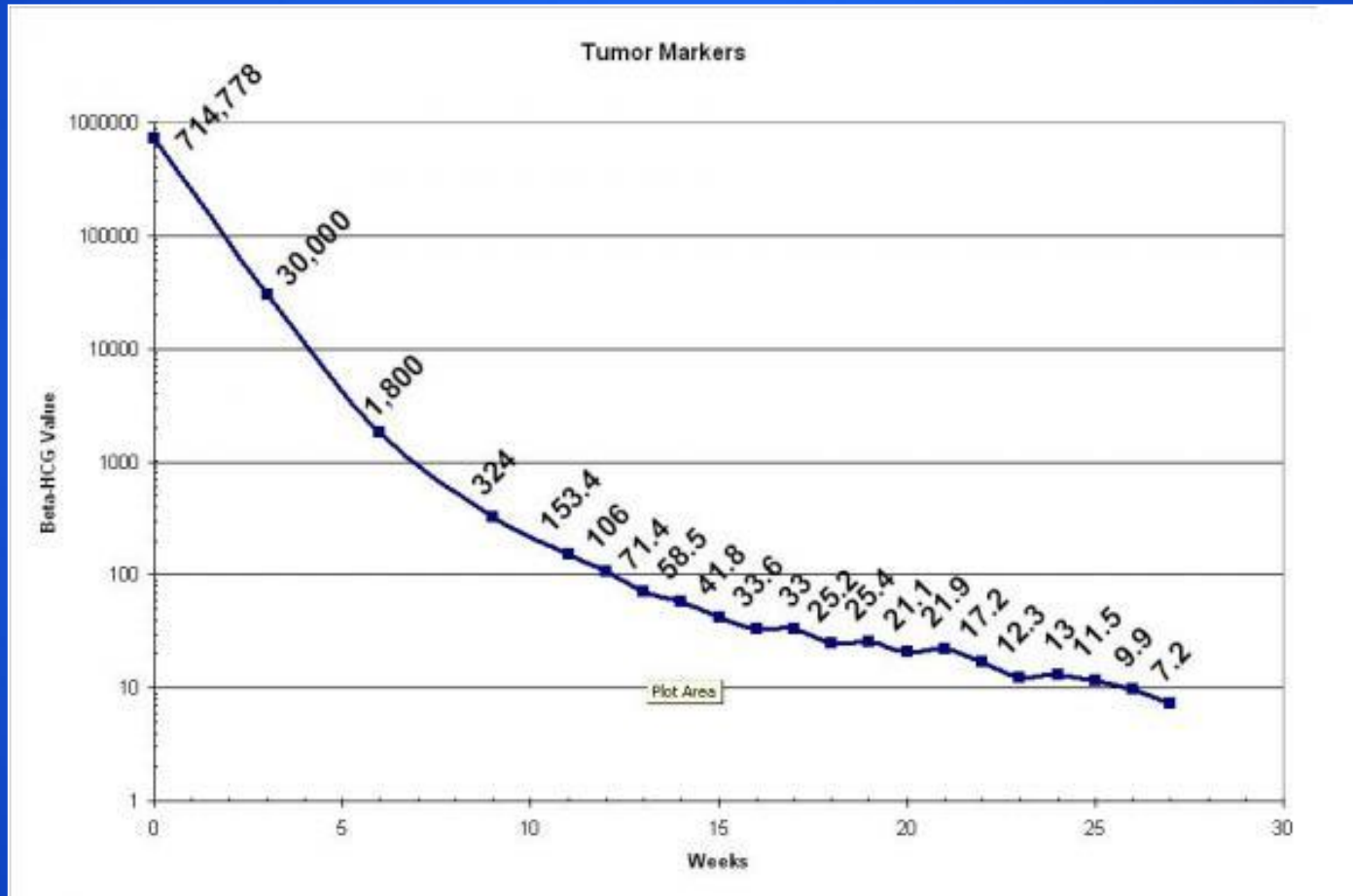Controls

Serum PSA, ng/mL — Time Prior to Diagnosis, years
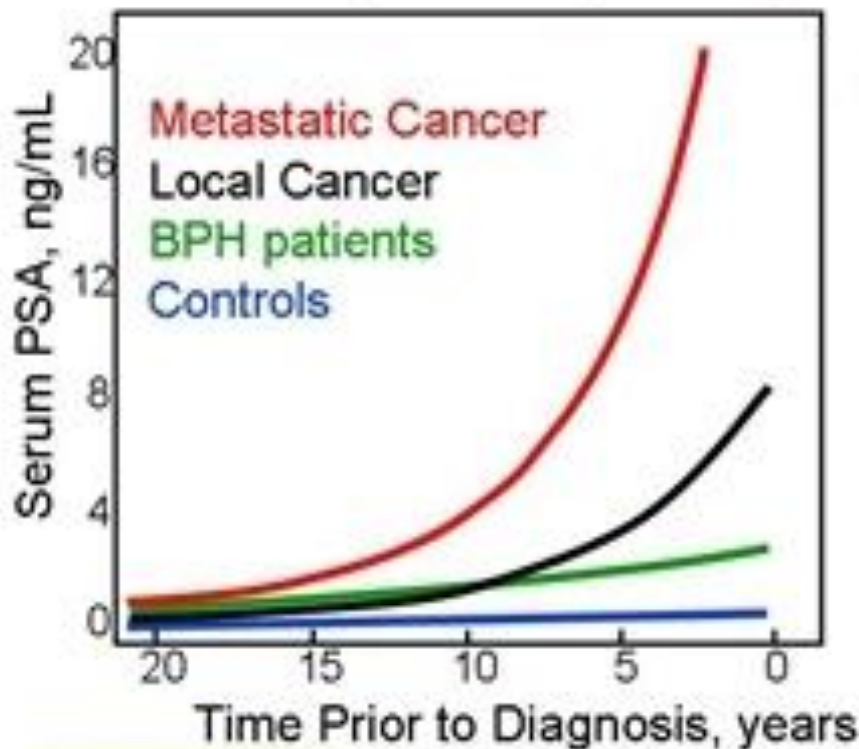
- NCCN Guidelines (2009) calculate the change in PSA over a 1-year period
  - For PSA <4, an increase of ≥0.35 ng/mL/yr is suspicious
  - For PSA 4-10, an increase of ≥0.75 ng/mL/yr is suspicious
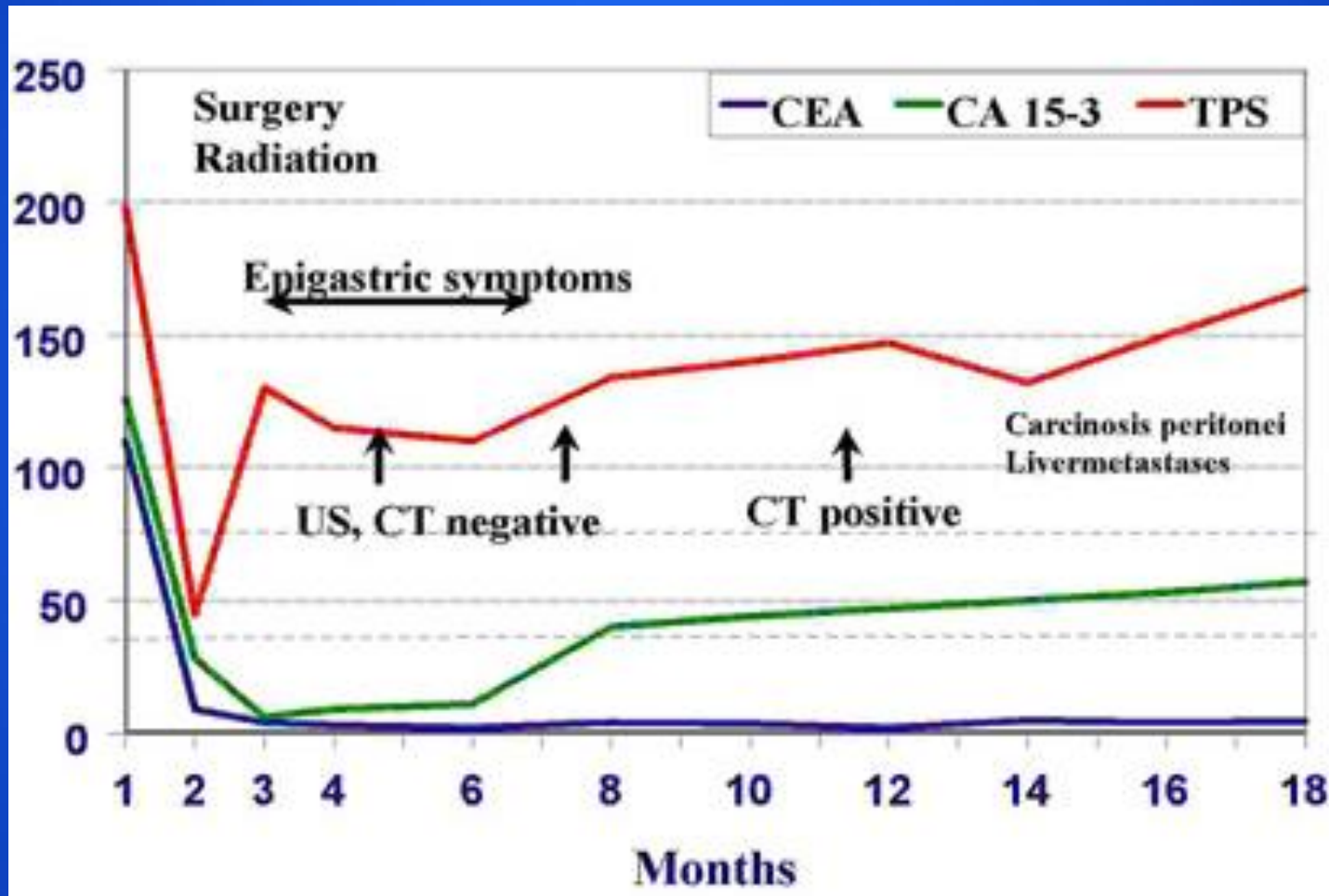 - Use 3 specimens over 18-24 month interval

Tumor Markers-follow up
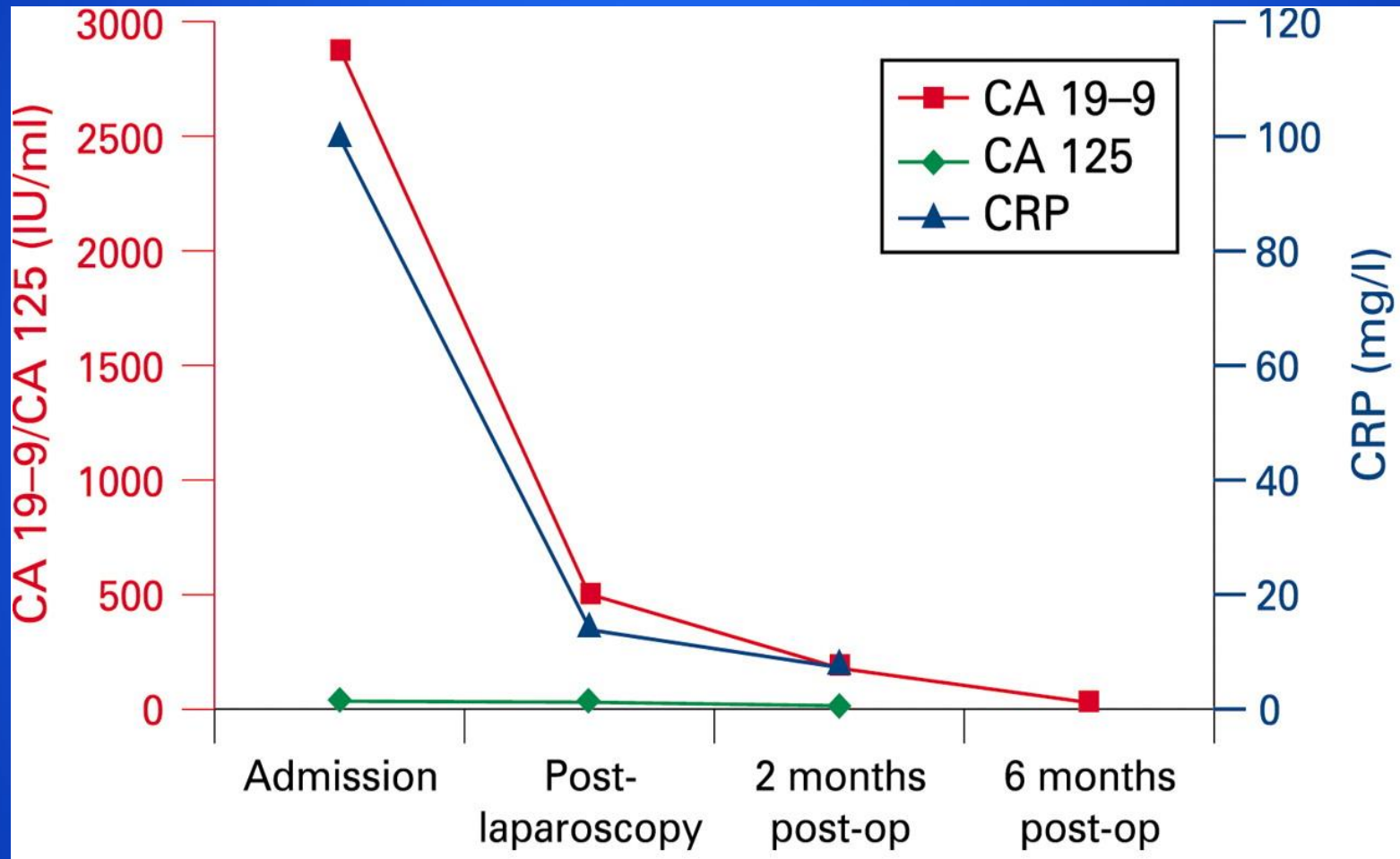
Tumor Markers-follow up

Tumor Markers-follow up

Hormones & Cancer

Hormones related to tumor growth:

- Usually sex hormones (testosterone,estrogen)
- They may have a relation to tumor growth
- Hormone receptors
- The concept can be used in treatment

Hormones may be produced by tumors:

- Originally hormone producing organ e.g. adrenals
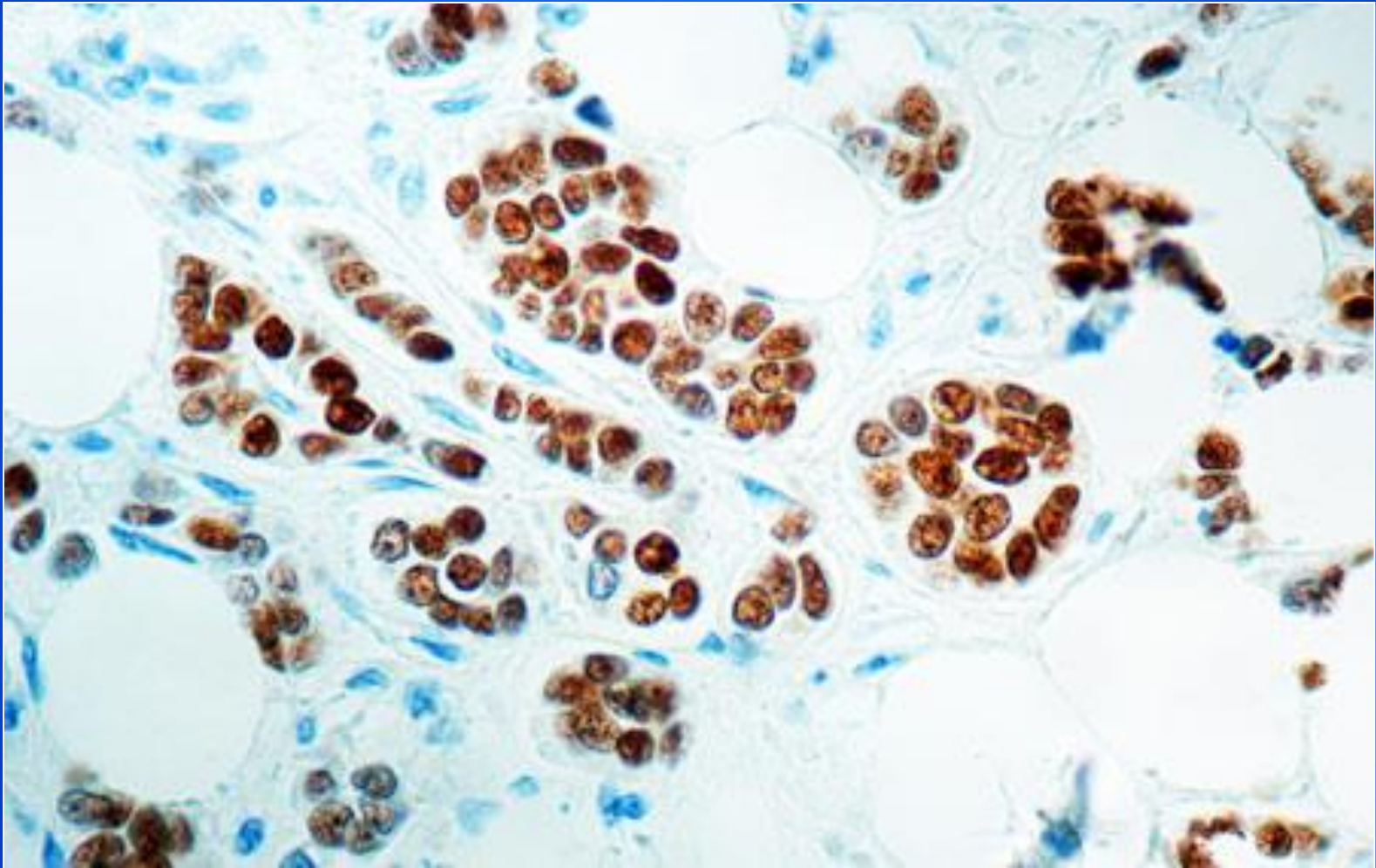- Originally non hormone producing organ e.g. lung

Testosterone and Prostate Cancer
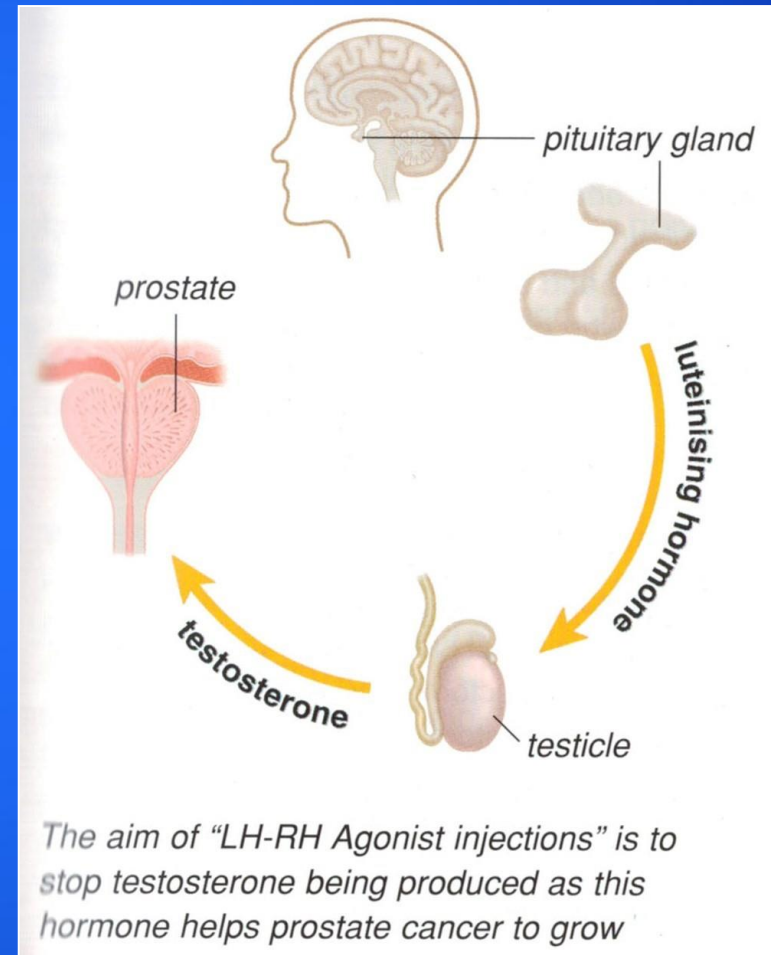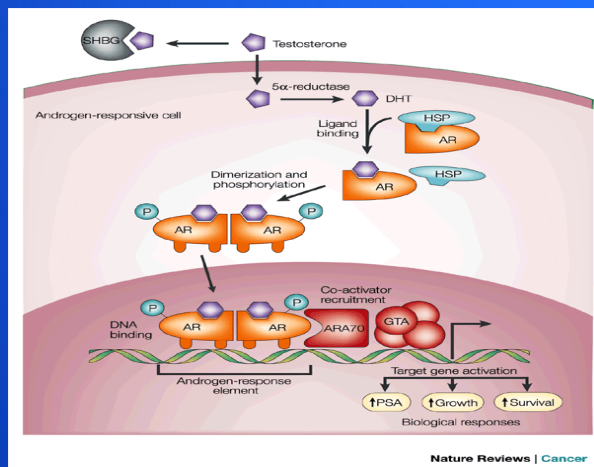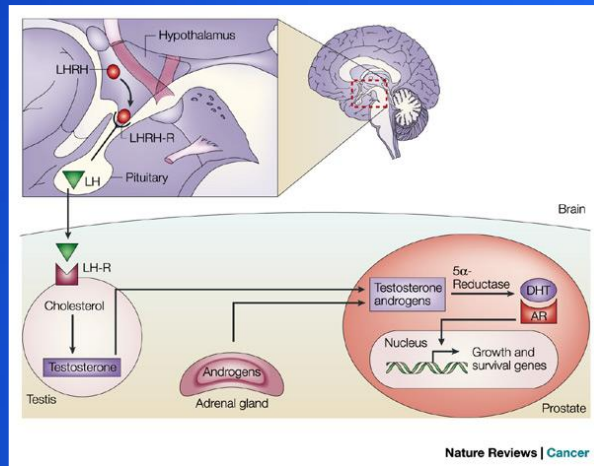
The aim of "LH-RH Agonist injections" is to stop testosterone being produced as this hormone helps prostate cancer to grow

Estrogen receptors-breast cancer

Estrogen receptors-breast cancer