Cancer

What Is Cancer?

- Cancer – a large group of diseases characterized by the uncontrolled growth and spread of abnormal cells
- Neoplasm – new growth of tissue that serves no physiological function

Tumor

- **Tumor –** is a condition where there is abnormal cellular growth thus forming a
- lesion or in most cases, a **lump** in some part of your body.
- Types:
  - Benign tumor – grows in confined area
  - Malignant tumor – capable of **invading**
    - surrounding tissues

Seven Warning Signs of Cancer
CAUTION

- Change in bowel or bladder habits
- A sore throat that does not heal
- Unusual bleeding or discharge from body orifice
- Thickening or lump in breast or elsewhere
- Indigestion of difficulty in swallowing
- Obvious change in wart or mole
- Nagging cough or hoarseness

Types of Cancer

- Carcinomas
- Sarcomas
- Lymphomas
- Leukaemias
- Adenomas

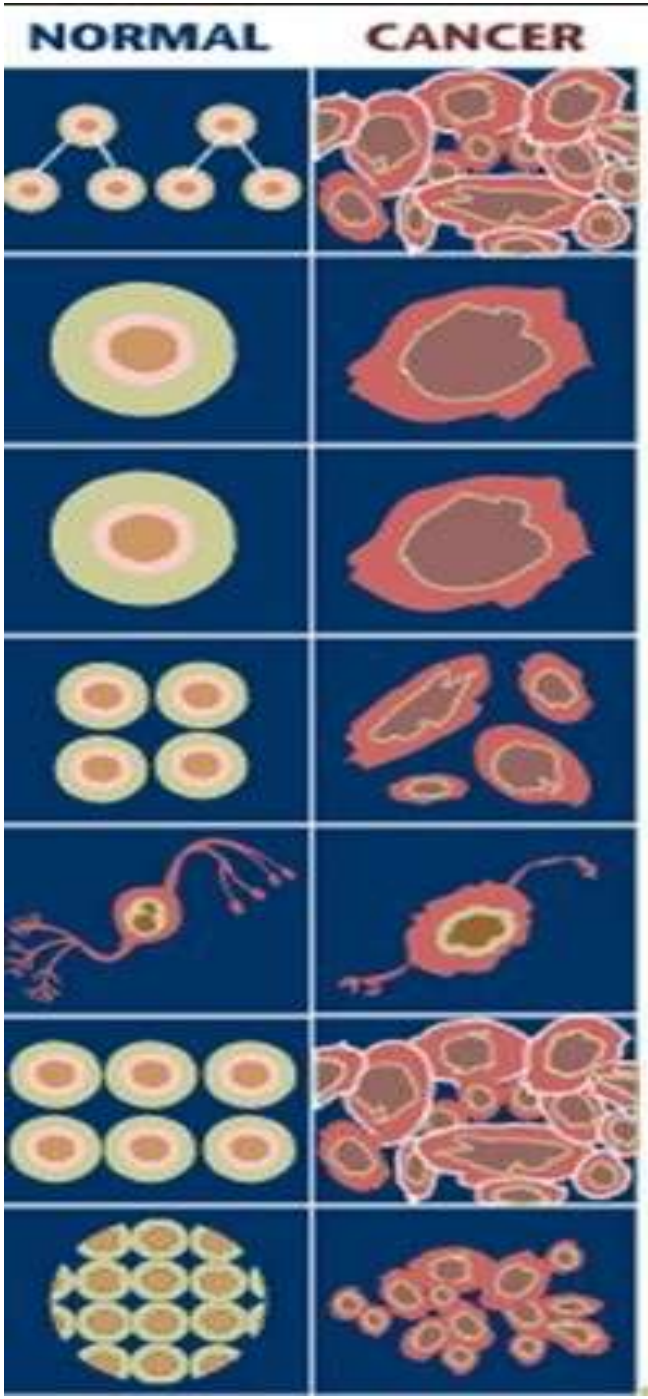
  - Often prefixed by the specific cell

Types of Cancer

- Cancers can be broadly grouped into different types, depending on which tissues they come from.
- **Carcinomas**, the most common types of cancer, arise from the cells that cover external and internal body surfaces.
  - – Lung, breast, and colon are the most frequent cancers of this type.
- **Sarcomas** are cancers arising from cells found in the supporting tissues of the body such as bone, cartilage, fat, connective tissue and

Types of Cancer

- **Lymphomas** are cancers that arise in the lymph nodes and tissues of the body's immune system.
- **Leukaemias** are cancers of the immature blood cells that grow in the bone marrow and tend to accumulate in large numbers in the bloodstream.
- **Adenomas** are tumours that come from glandular tissue like the thyroid, the pituitary gland the adrenal gland. They are often benign.



Large # of dividing cells

Large, variably shaped nuclei

Large nucleus to cytoplasm ratio

Variation in size and shape

Loss of normal cell features

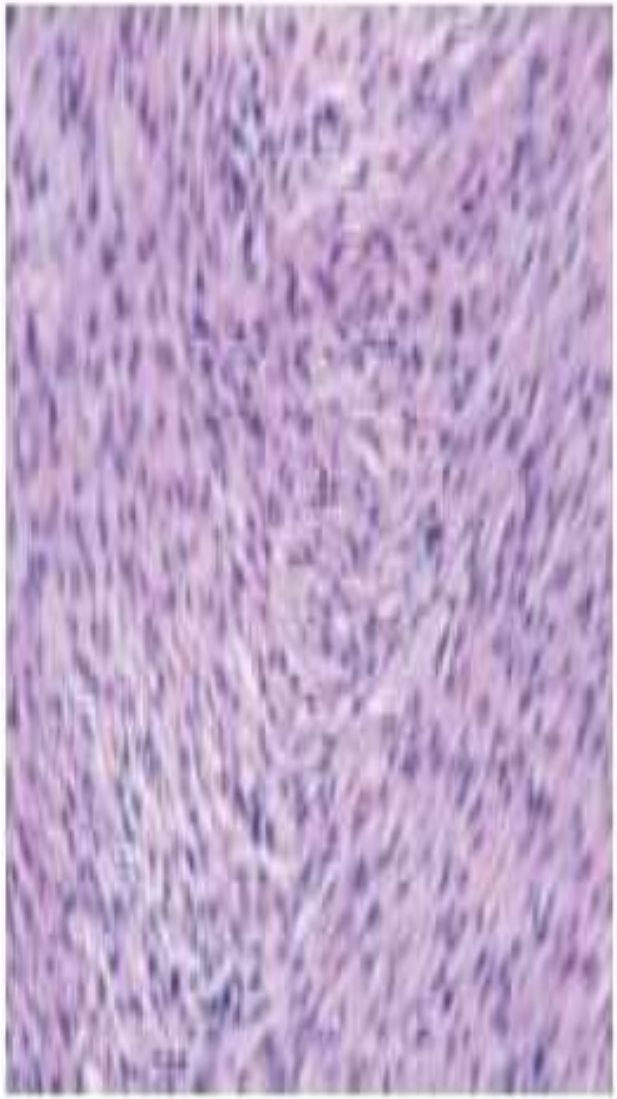
Disorganized arrangement

Poorly defined tumor boundary

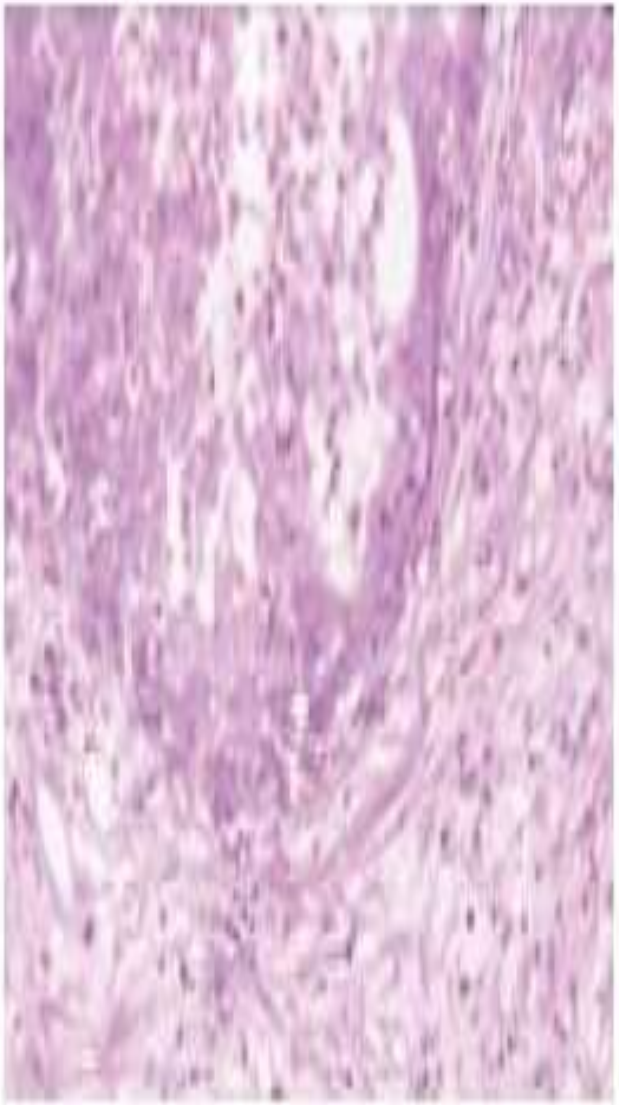
Benign & Malignant tumors

- Based on Spread to nearby tissues
- **Benign tumors** do not cross tissue planes as defined by basement membranes, while malignant tumors invade across tissue planes
- **Metastatic tumors** spread to remote locations in the body through blood, lymph vessels, transcoelomic (peritoneal, pleural, pericardial spaces) routes

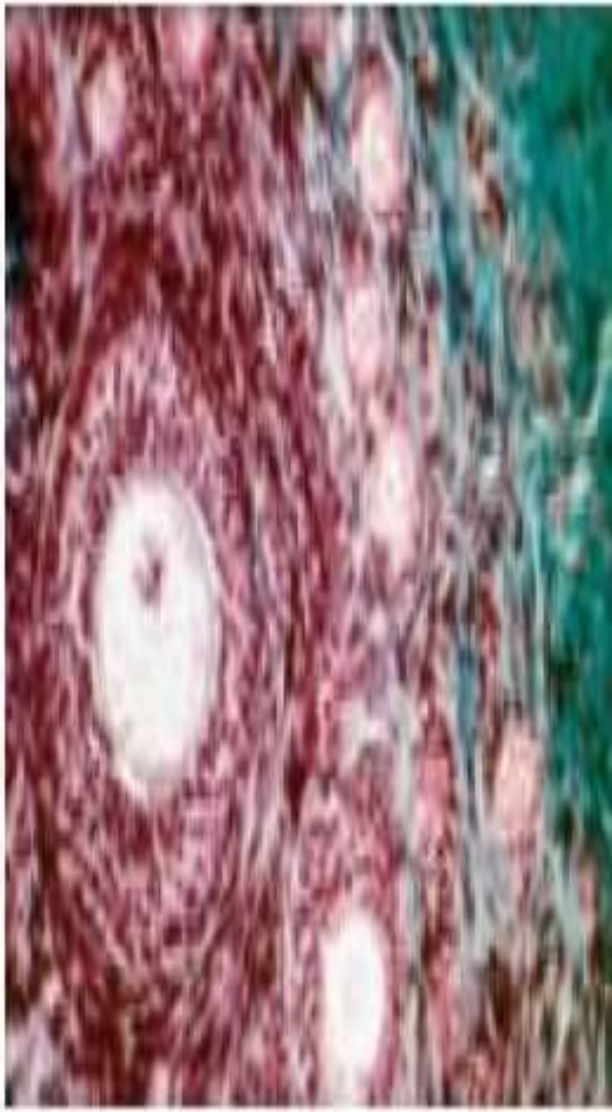
(a) Normal ovarian tissue



(b) Benign ovarian tumor

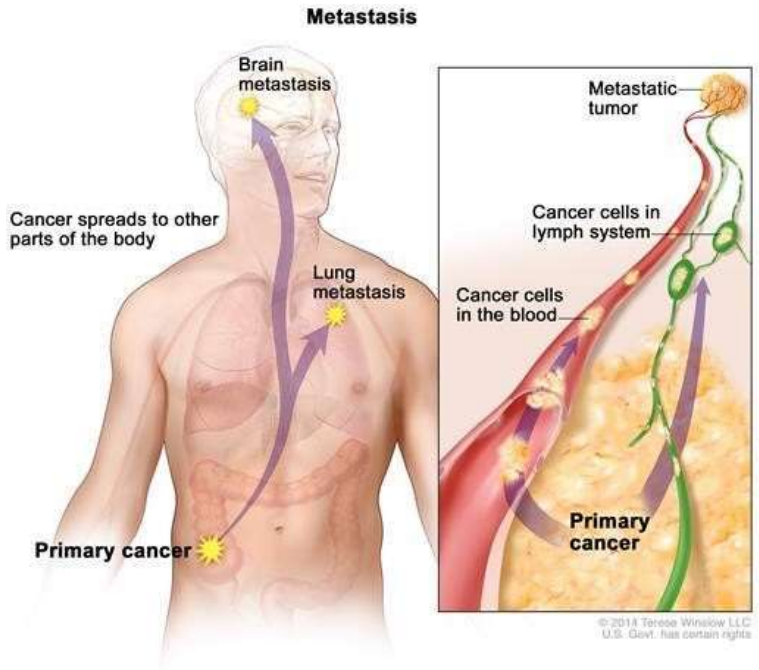


(c) Malignant ovarian tumor



Metastasis

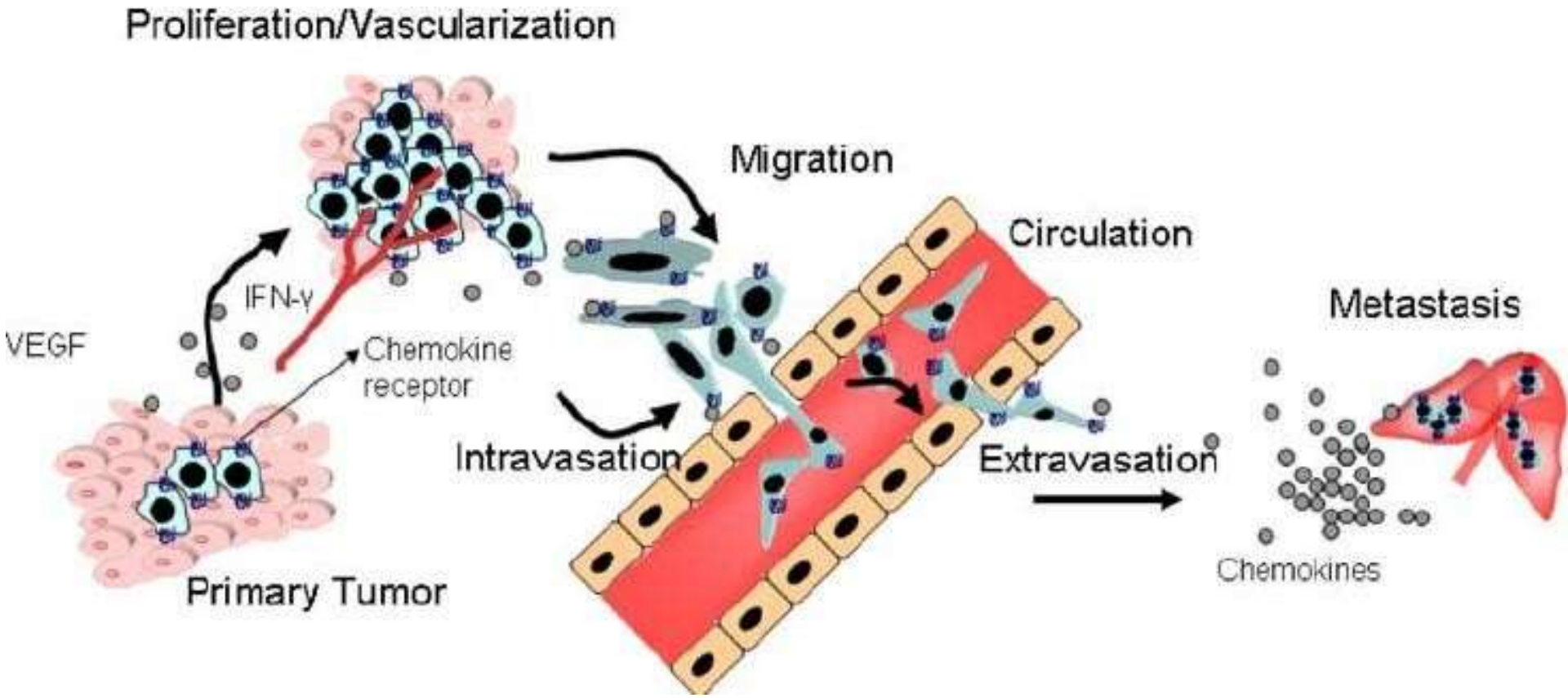
- **Metastasis** is the spread of cancer cells to new areas of the body (often by way of the lymph system or bloodstream).
- A **metastatic** cancer, or **metastatic** tumor, is one which has spread from the primary site of origin (where it started) into different area(s) of the body.



Metastasis

The invasion-metastasis cascade:

- Local invasion followed by **intravasation** of cancer cells into nearby blood and lymph vessels
- Transit via lymph and blood followed by escape from vessels into distant parenchyma (**extravasation**)
- Formation of small tumor nodules (**micrometastases**)
- Growth into macroscopic tumors (**colonization**)


Proliferation/Vascularization
Migration
Circulation
Metastasis
IFN-γ
VEGF
Chemokine
receptor
Intravasation
Extravasation
Primary Tumor
Chemokines

Carcinogens

- Any substance that is capable of causing cancer.
- Carcinogens are chronic toxins. They cause damage after repeated or long-duration exposure.
- They may have not immediate apparent harmful effects, with cancer developing only after a long latency period.

What materials are carcinogens?

_ Asbestos

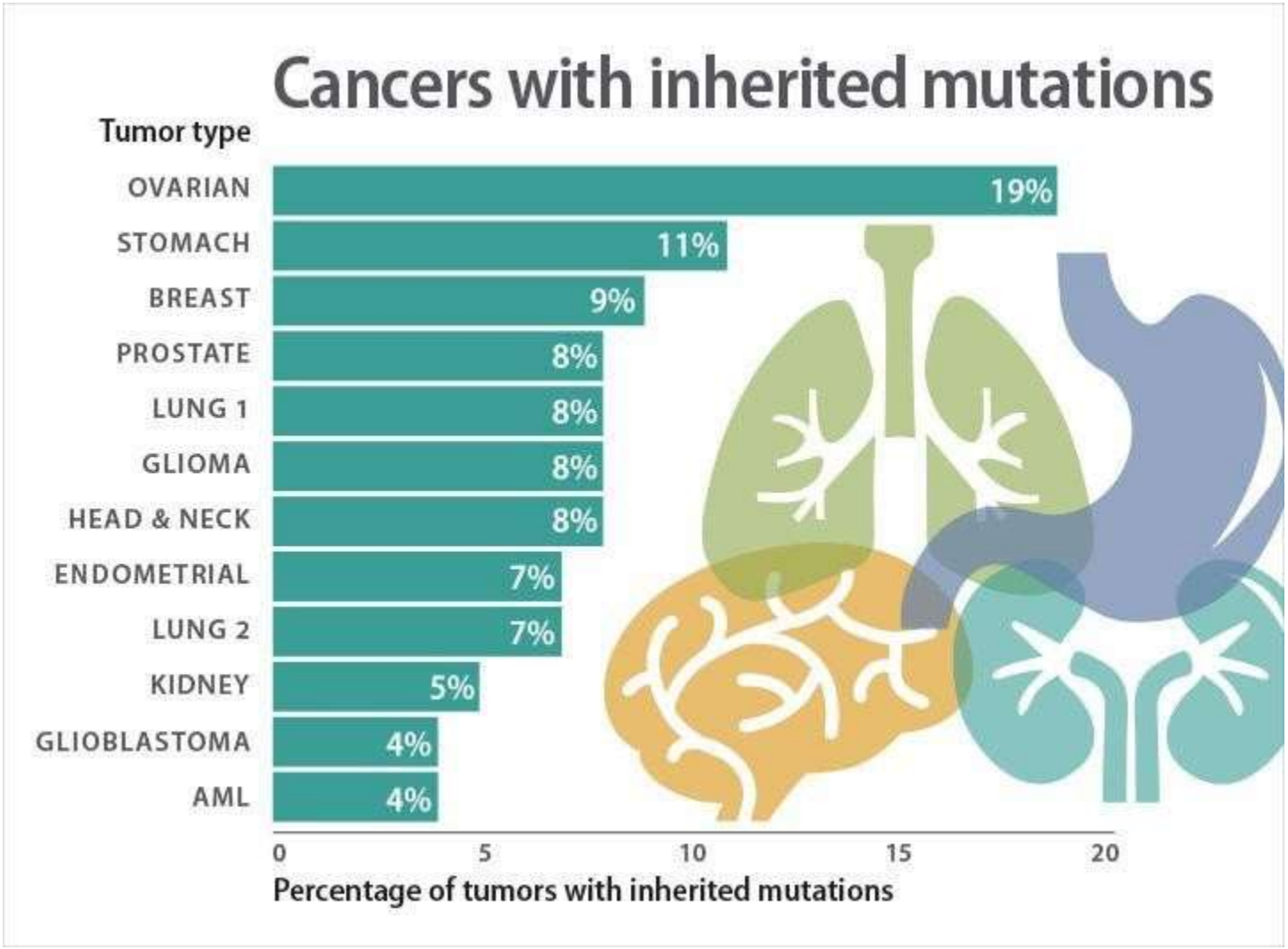
_ Certain chemicals

_ Coal tars and coke oven emissions

_ Ionizing radiation

_ Tobacco smoke

_ Ultraviolet radiation



The study, from Washington University School of Medicine in St. Louis, appears December 2015 in the journal *Nature Communications*.

DIAGNOSIS

Physical Diagnosis - Melanoma

A = Asymmetry, one half the mole does not look like the other half.

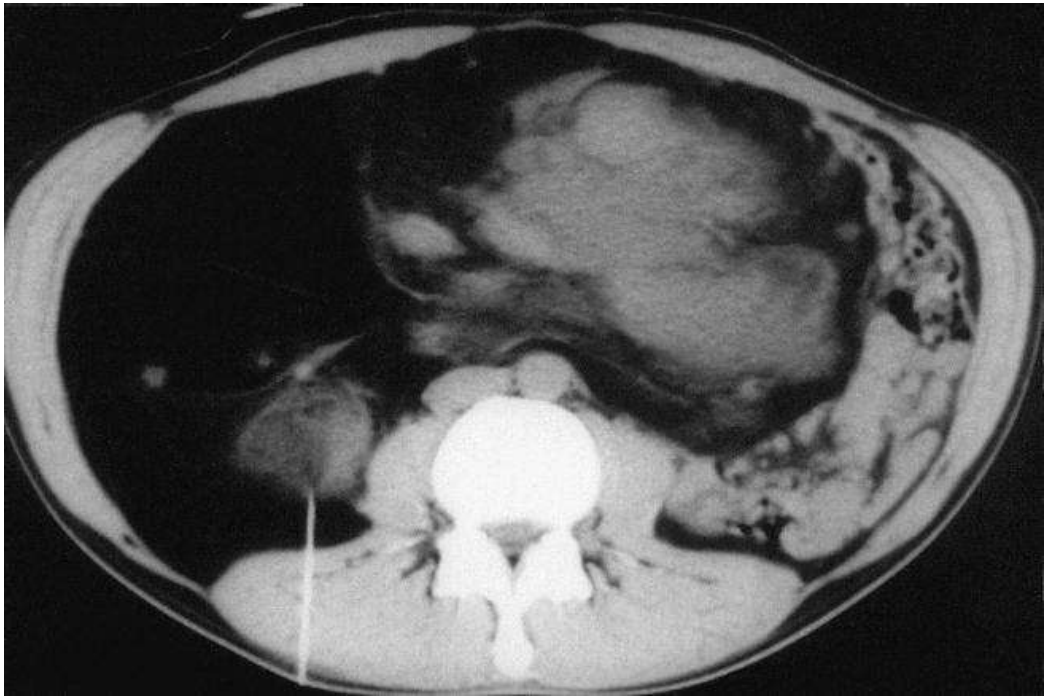
B = Border, irregular scalloped or poorly circumscribed border.

C = Color, varied from one area to another; shades of tan, brown, black, or sometimes white, red, or blue.

D = Diameter, larger than 6 mm (the diameter of a pencil eraser).

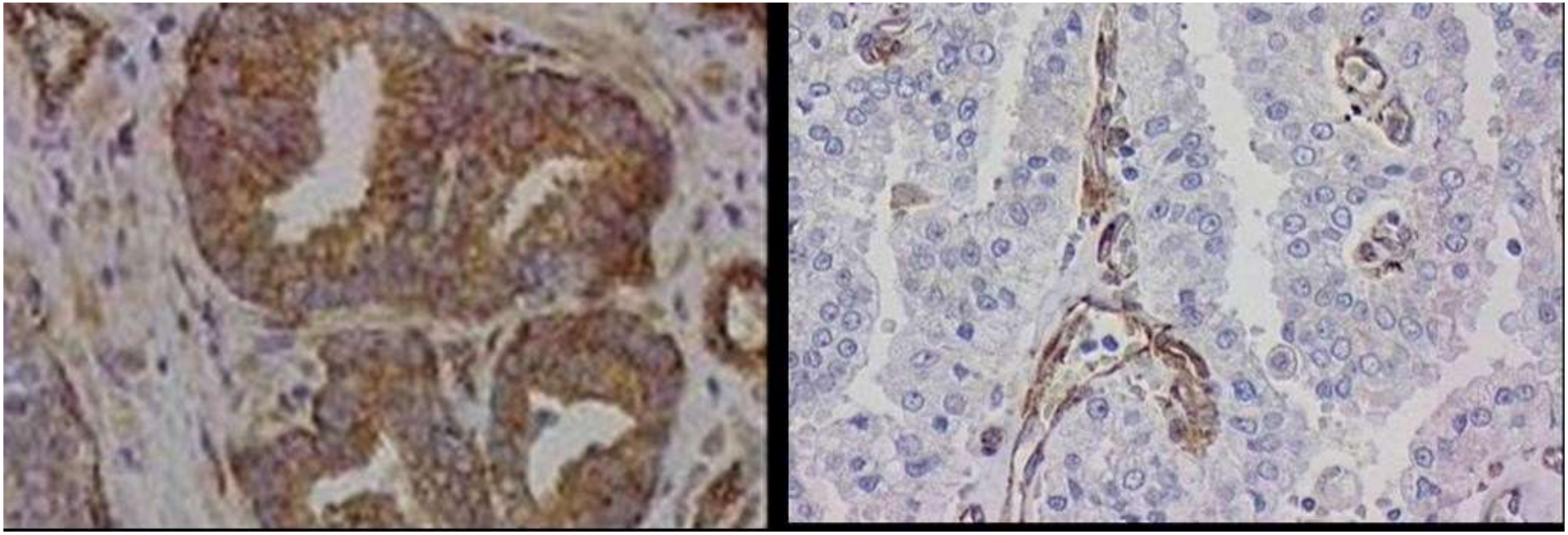
The Gold Standard of Diagnosis - Biopsy

- The only absolutely certain way to diagnose a cancer is to take a cell sample (a process called a biopsy) and look at it under a microscope. This is usually done by placing a needle into the affected area and sucking out some cells.



CT image-directed biopsy. A patient with a large retroperitoneal liposarcoma occupying nearly 75% of the total abdominal and retroperitoneal space. A CT-directed needle biopsy is being performed in an area of suspected liposarcoma dedifferentiation. The posterior approach through the lumbar musculature allowed positive identification of dedifferentiation, which led to initial neoadjuvant therapy prior to an ultimately successful surgical resection.

Tumor specific protein staining



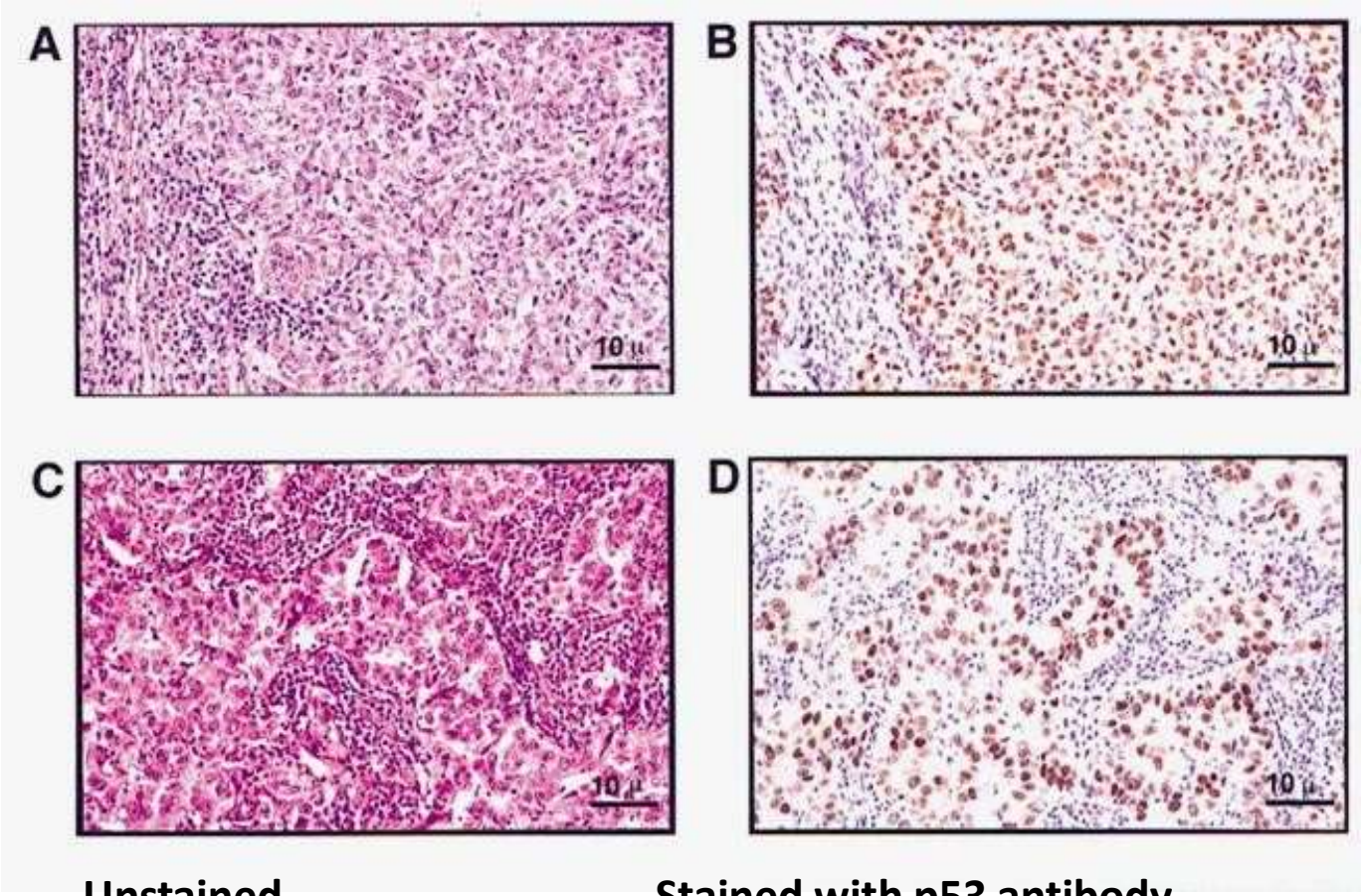
A. Prostate Cancer Stained for HIP-1

B. Normal Prostate Stained for HIP-1

Staining Breast Cancer for p53

Medullary Cancer

Glandular Cancer



Unstained **Stained with p53 antibody**

Imaging

- Diagnosis of oral cancer usually by surgical or fine needle biopsy.

- Imaging techniques are used to determine the extent of the disease and detect recurrent disease following therapy

Imaging Techniques

- **CT: Computed tomography**
  - CT scans show a slice, or cross-section, of the body. The image shows your bones, organs, and soft tissues more clearly than standard x-rays.
  - CT scans can show a tumor's shape, size, and location. They can even show the blood vessels that feed the tumor – all without having to cut into the patient.
- **MRI: Magnetic resonance imaging**
  - MRI uses strong magnets to make the images – not radiation. An MRI scan takes cross-sectional slices (views) from many angles, as if someone were looking at a slice of your body from the front, from the side, or from above your head.
  - MRI is very good at finding and pinpointing some cancers. An MRI with contrast dye is the best way to see brain and spinal cord tumors. Using MRI, doctors can sometimes tell if a tumor is or isn't cancer.
  - MRI can also be used to look for signs that cancer may have metastasized
- **PET: Positron emission tomography**
  - PET scans usually use a form of radioactive sugar. Body cells take in different amounts of the sugar, depending on how fast they are growing.
  - Cancer cells, which grow quickly, are more likely to take up larger amounts of the sugar than normal cells.

Treatment

- Surgery, radiation and chemotherapy are the treatment modalities for malignancies.
  - Radiation therapy- Radiation therapy is the administration of ionizing radiation to a cancer patient for the purpose of cure, palliation or as an adjunct to surgical treatment.
  - Chemotherapy-It is the use of anticancer drugs designed to slow or stop the growth of rapidly dividing cancer cells in the body. The drugs may be used: As a primary treatment to destroy cancer cells.
  - Surgery- Surgery forms the basis of therapy for early cancer in which case it is employed as local treatment for small tumors, to reduce the bulk of the disease, and for removal of metastatic tumors.