CANCER

1. In our body, cell growth & differentiation is highly controlled & regulated

2. In cancer cells, there is breakdown of these regulatory mechanism.

3. Normal cell exhibit ***CONTACT INHIBITION***. Due to this contact of one cell with other inhibits its uncontrolled growth.

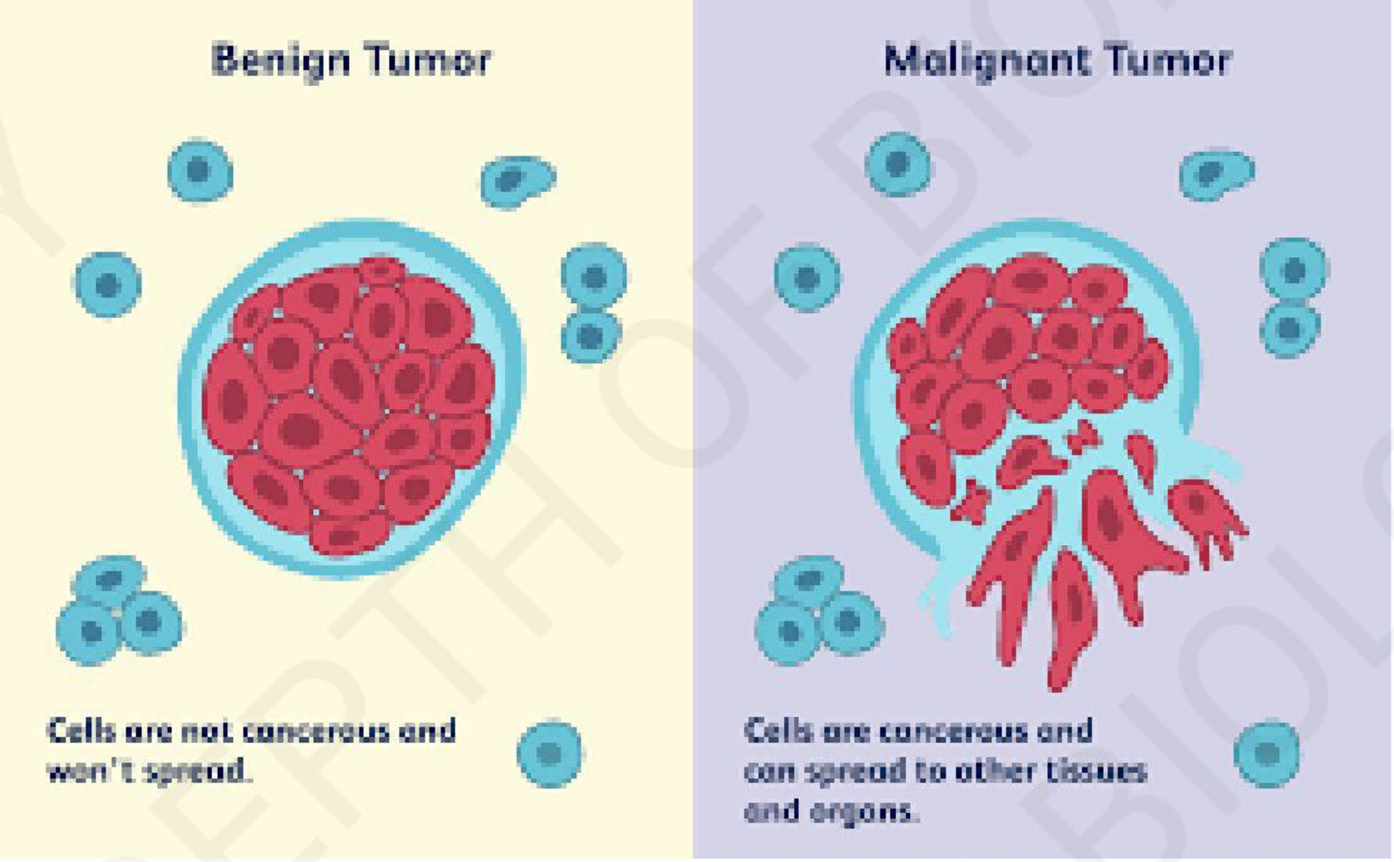
Cancer cells lose contact inhibition . As a result of this , cancerous cell continue to divide giving rise to masses of cells called ***TUMORS***

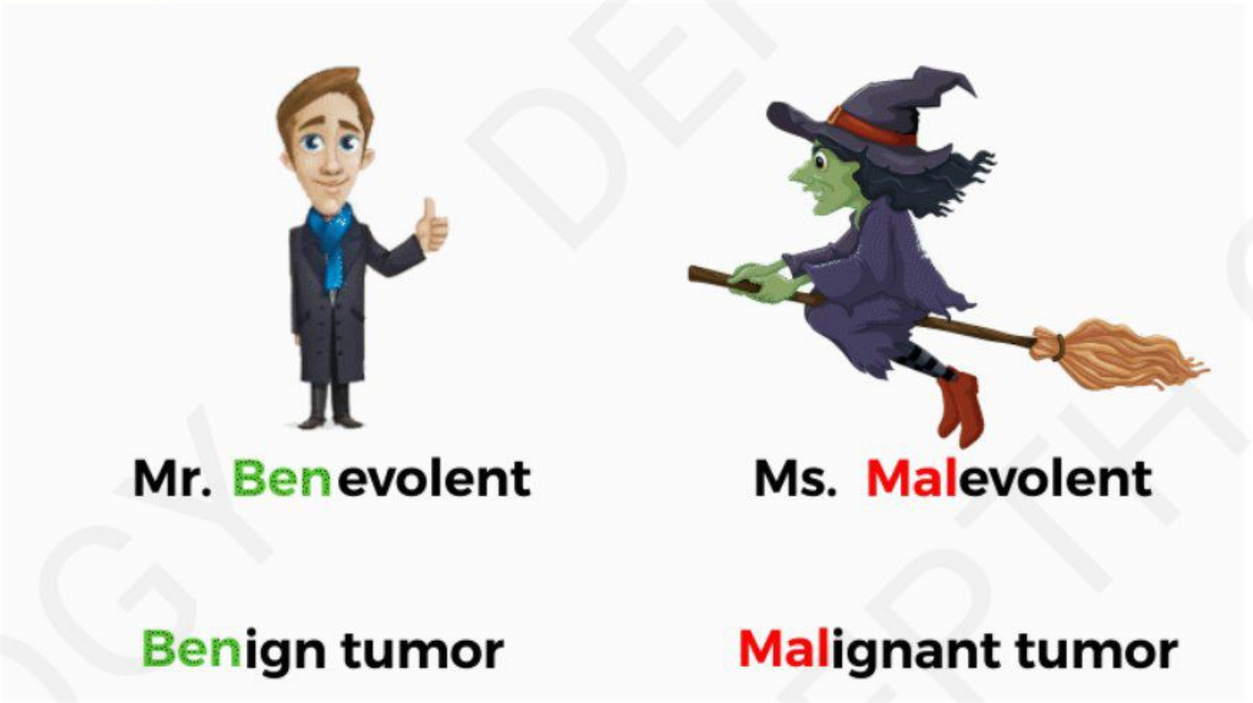
DEPTH OF BIOLOGY

TYPES OF TUMOR

BENIGN TUMOR: remain limited to their original location & do not spread to other parts of the body. They cause less damage.

MALIGNANT TUMOUR: mass of proliferating cell called NEOPLASTIC or TUMOR cell. These cells grow very rapidly. Thus they invade & damage the surrounding normal tissues. As these cells are actively dividing and growing it leads to the starvation of normal cell by competing for vital nutrients. Cells may be sloughed from such tumors & reach distant sites through blood. Wherever they get lodged in the body they cause emergence of new tumor. This property is called METASTASIS.


Benign Tumor
Cells are not cancerous and won't spread.
Malignant Tumor
Cells are cancerous and can spread to other tissues and organs.


Mr. Benevolent
Ms. Malevolent
Benign tumor
Malignant tumor

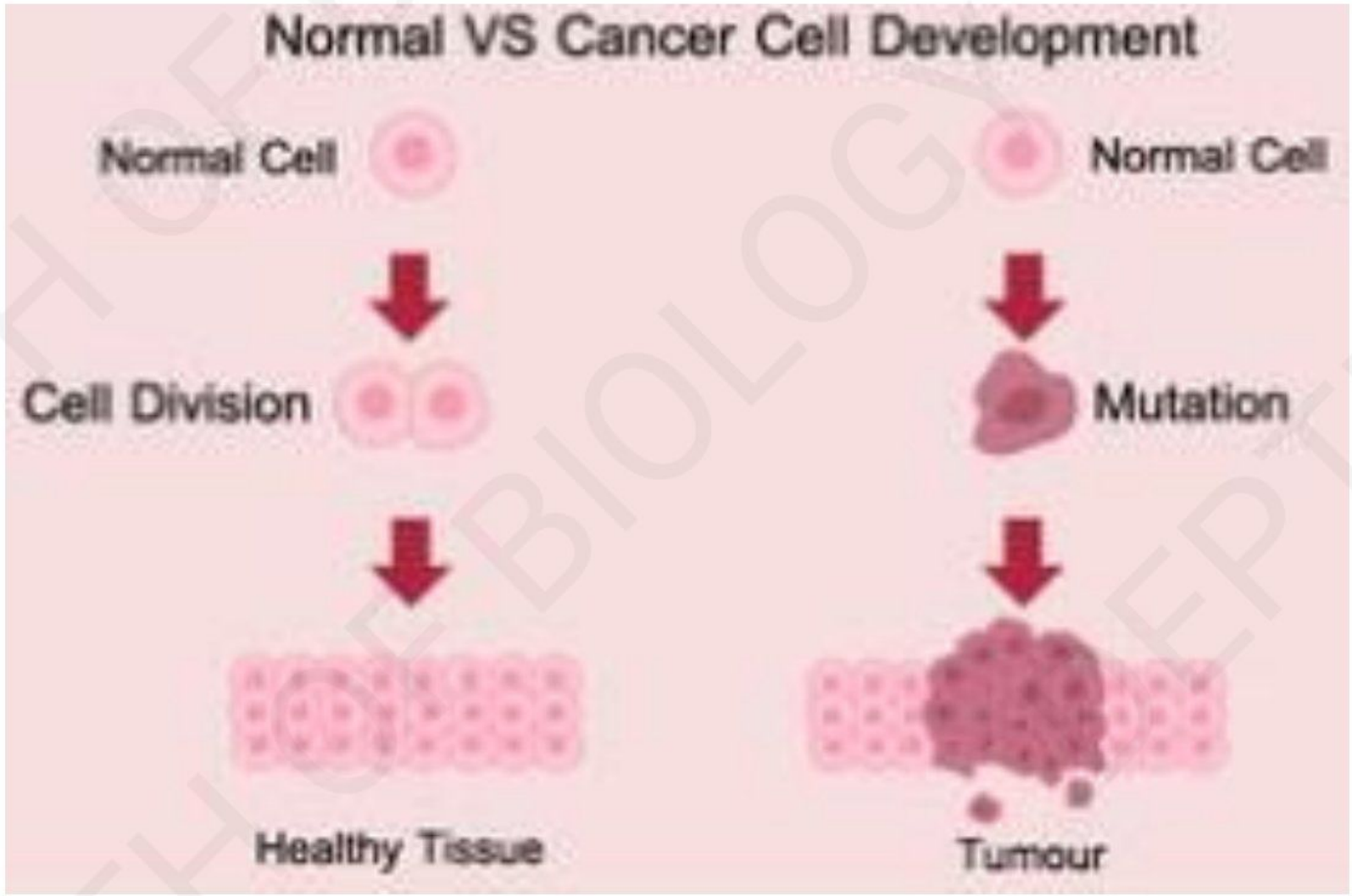
DEPTH OF BIOLOGY

CAUSE OF CANCER

- Transformation of normal cell into cancerous neoplastic cell may be induced by physical, chemical or biological agents.
- These agents are called carcinogens

COMMON CARCINOGENS

- Ionising radiation : X and gamma rays
- Non-ionising radiation : UV
- Both ionising & non- ionising radiations cause DNA damage that causes neoplastic transformation
- The chemical carcinogen present in tobacco smoke have been identified as a major cause of lung cancer


Normal VS Cancer Cell Development
Normal Cell
Cell Division
Healthy Tissue
Normal Cell
Mutation
Tumour

- Oncogenic viruses are cancer causing viruses. They have genes called viral oncogenes.
- Several genes called cellular oncogenes [c-onc] or proto oncogenes have been identified in normal cells which can be activated under certain conditions & therefore lead to oncogenic transformation of the cells

DEPTH OF BIOLOGY

CANCER DETECTION AND DIAGNOSIS

- Early detection of cancers is essential as it allows the disease to be treated successfully in many cases. Cancer detections based on:-
- ***Biopsy:*** a piece of the suspected tissue cut into thin sections is stained.
- ***Histopathological*** studies of the tissue (thin sections are examined under the microscope).
- ***Blood and bone marrow tests***: for increased cell counts in the case of leukemia.
- ***Radiography***: use of X-rays

- ***CT (computed tomography):*** This technique uses X-rays to generate a three-dimensional image of the internals of an object.
- ***MRI (magnetic resonance imaging):*** MRI involves use of strong magnetic fields and non-ionizing radiations to accuratelydetect pathological and physiological changes in the living tissue.
- Antibodies against cancer-specific antigens: Used for detection of certain cancers.

TECHNIQUES OF MOLECULAR BIOLOGY :

To detect genes in individuals with inherited susceptibility to certain cancers.

- Identification of such genes may be helpful in prevention of cancers. Such individuals may be advised to avoid exposure to particular carcinogens to which they are susceptible (e.g., tobacco smoke in case of lung cancer).

DEPTH OF BIOLOGY

TREATMENT OF CANCER

- Treatment of cancer can be done by one or combinations of different approaches. The common approaches for treatment of cancer are surgery, radiation therapy, chemotherapy and immunotherapy.
- ***<u>In radiotherapy</u>***, tumor cells are irradiated lethally, taking proper care of the normal tissues surrounding the tumor mass.

- Several chemotherapeutic drugs are used to kill cancerous cells. These drugs may be specific for particular tumors.Most drugs have side effects like hair loss, anemia, etc.

- Majority of the cancers are treated by a combination of all the above methods.

- Tumor cells avoid detection and destruction by immune system. Therefore, they are treated with substances called biological response modifiers.

- They are substances such as a-interferon which activate their immune system and help in destroying the tumor.

DEPTH OF BIOLOGY

CLASSIFICATION OF CANCER

- Cancer can be classified according to the type of tissue in which the cancer originates & by the primary location where the cancer 1st developed.
- Based on tissue type, cancers are classified into 6 major categories.

1.CARCINOMA	**4.SARCOMA**
2.MYELOMA	**5.LEUKEMIA**
3.LYMPHOMA	**6.MIXED- TYPE**

1. ***CARCINOMA-*** malignant tumor of epithelial cell which are found on the skin covering, lining of organs & internal passage ways such as G.I. tract

2 types of carcinoma

ADENOCARCINOMA	SQUAMOUS CELL CARCINOMA.

Carcinoma usually affect organs capable of secretion including breast, lung, bladder, prostrate & colon.

- **ADENOCARCINOMA-** usually develops is mucous secretory glands & is rapidly spreading.
- **SQUAMOUS CELL CARCINOMA-** one of the main type of skin cancer.

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2.***SARCOMA-*** malignant tumor of C.T. & supporting tissue cells; including muscles, tendons, fat, cartilage, blood & lymph vessels, nerves & tissues around joints.

Sarcoma can also originate in the bone

Soft tissue & bone sarcoma are the main types of sarcoma.

3. MYELOMA- cancer originate in the plasma cells of bone marrow

- *Plasma cell are W.B.C that produces antibodies*
- When myeloma cell prevent normal production of antibody the immune system is weakened & there is an interference with the normal production & function of the red & white blood cells

- Patient often have bone pain & fracture, anemia & susceptibility to infection
- A single cell plasma cell tumor is called a ***ISOLATED/ SOLITARY plasmacytoma.***
- more than one plasmacytoma = multiple myeloma.

4.LEUKEMIA- is a cancer of blood including the bone marrow & lymph nodes.

- Bone marrow produces abnormal W.B.C. That fail to provide immunity- causing the patient to be prone to infection
- R.B.C. Also affected can cause poor blood clotting and fatigue from anaemia

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5. LYMPHOMA- cancer of the lymphatic system develops in the glands or lymph nodes.

- Immune cell [system] is unable effectively guard against infection

2 types

HODGKIN'S LYMPHOMA	NON-HODGKIN'S LYMPHOMA

- The cancerous cells of HODGKIN's lymphoma crowd out the normal white cells & the immune system is unbale to effectively guard against infection

 # THIS 2 TYPE OF LYMPHOMA IS DIFF. BY BIOPSY OF A LYMPH NODE

- The presence of Reed-Sternberg cell [huge mutated B-lymphocyte] distinguishes HODGKIN's lymphoma from NON- HODGKIN's lymphoma.

6. MIXED TYPE:

≥ 2 components of cancer

Such as ***CARCINOSARCOMA*** or ***TERATOCARCINOMA.***

The most common sites where this develops are

- RECTUM
- COLON
- FEMALE BREASTS
- UTERUS
- SKIN
- LUNG

DEPTH OF BIOLOGY