HUMAN HEALTH AND DISEASE

CANCER

CANCER (CAUSES AND TREATMENT) AND DRUGS

CANCER

Uncontroled, Abnormal and **excessive mitotic** division of cells is called **cancer** (Crab = cancer) Study of cancer is called **oncology**

This abnormal and undifferentiated cells are called **cancerous cells.**

TUMOUR OR NEOPLASM (NEW GROWTH) :

TYPES OF TUMOURS -

- **Benign Tumour :** Capsulated, localised to the site of origin & does not spread to another parts of body, it is non-metastatic, non-malignant, non-cancerous, Non invasive.

Example -

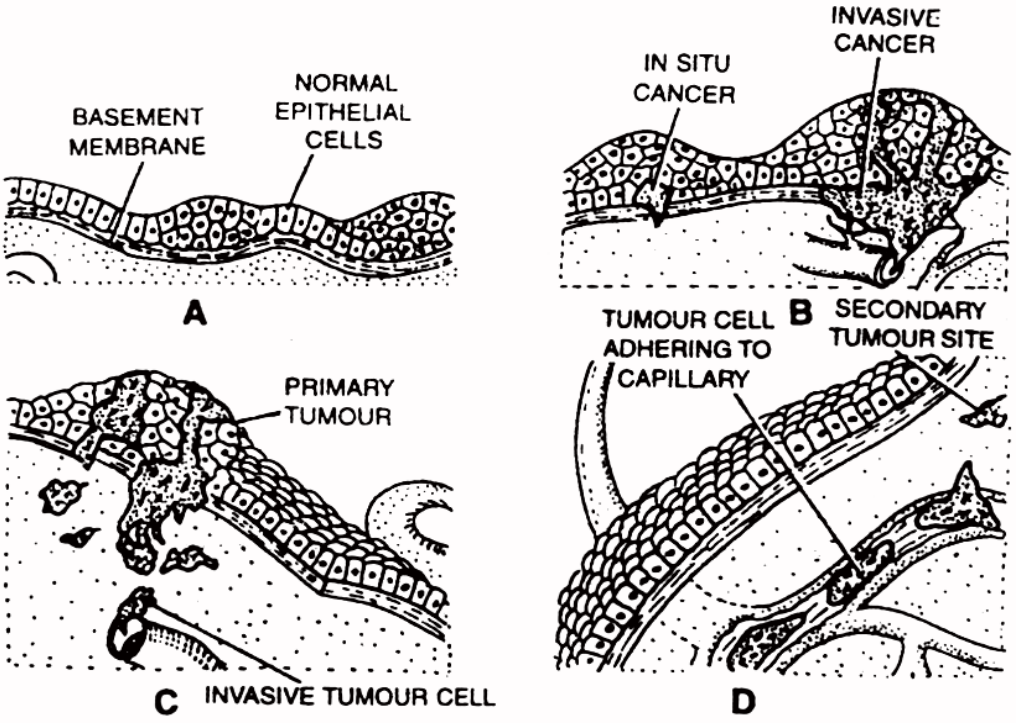
G Bone tumour - Osteoma

G Muscle tumour – Myoma

- **Malignant Tumour (Malignant = Harmful) :** Some of the cancerous cells detach from their origin place and spread to other parts of body by blood and lymph. Then cancerous cells form fresh colonies there. This is called metastasis or sec. growth. This type of tumour is called metastatic or cancerous tumour. It is invasive tumour.

Example -

G All malignant tumour are called cancers.



CANCER IS DIVIDED INTO 3 CLASSES ON BASIS OR ORIGIN :

- **Carcinoma :** This tumour originate from the **skin** and **epithelial** tissue

Example -

G Brain carcinoma G Oral carcinoma

G Gastric carcinoma G Colon carcinoma

G Lung carcinoma G Cervical carcinoma

G Adeno carcinoma (gland tumour) G Breast carcinoma

Carcinoma is most common type of tumour (85%)

Breast Cancer in female and **prostate** cancer in males are common incidence in world. Lung cancer accounts for 31.1% of all cancer death in men and 25% in women.

Cervical (Uterine Cervix) cancer in female and **oral cancer** in males are common in India.

Melanoma - It is type of carcinomas. These are cancerous growths of melanocytes (a type of skin cells).

- **Sarcoma :** This is tumour of mesodermal tissue.

Example -

G Bone cancer - Osteosarcoderma

G Muscle cancer - Myosarcoma

G Lymph node cancer - Lymphosarcoma

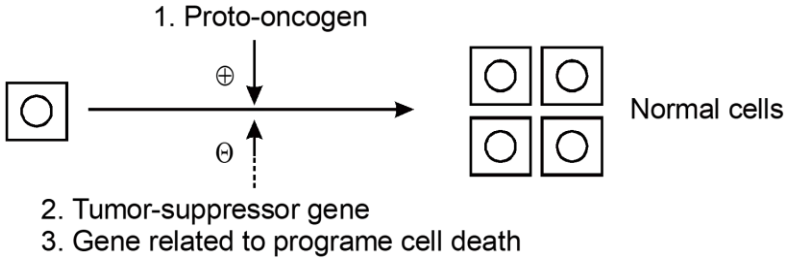
- **Leukaemia (Leucocyte = W.B.C.) or Blood Cancer :** This is cancer of **white blood** cells (WBC).

G **Chronic myelogenous Leukaemia (CML) :** This fatel cancer occurs mainly due to reciprocal translocation between chromosome-22 (Philadelphia chromosome) and chromosome 9.

G **Burkitt's Lymphoma (Denis parsons Burkitt, 1956 Africa) :** This is type of leukaemia which is produced due to reciprocal translocation between chromosome-8 and chromosome-14.

- **Normal mechanism of body growth -**

Normal cell division regulation by proto-oncogens and it is suppressed by tumour surppressor gene.



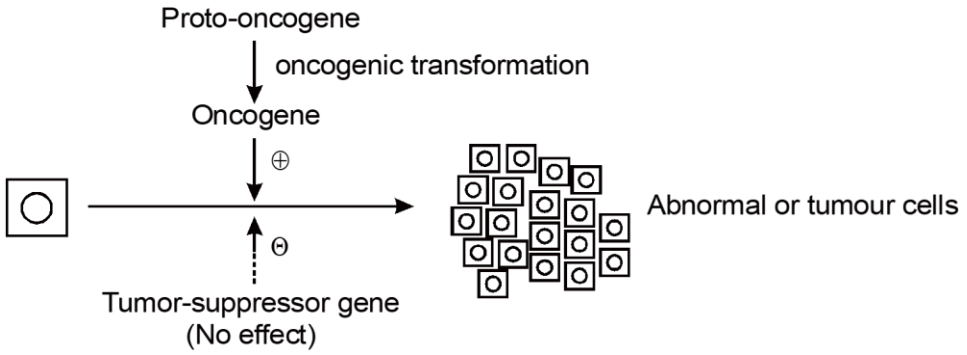
Causes of cancer –

Chemical or physical agents that can cause cancer are known as carcinogen. Depending on their mode of action, carcinogens fall into the following main categories :

- Agents that can cause alterations in the genetic material (DNA), resulting in **oncogenic trasformation**.
- Agents that promote the proliferation of cells, which have already undergoes genetic alteration responsible for oncogenic transformation. These agents are called tumour promoter e.g. some growth factors and hormones.

- Cancer causing DNA and RNA viruses (**tumour viruses**) have been shown to be associated with oncogenic transformation.

Transformation of a normal cell into cancer cell if the regulation is upset.



Carcinogen :

Causative agent cancer – Carcinogen

- **Chemical factor** : Tobacco and betal chewing cause oral cancer. Heavy smoking **(N-Nitrosodimethylene)** causes oral cancer, cancer of larynx and lungs. Combustion product of coal and pesticides, artificial flavour, sweetners, synthetic food, add flavour, hormonal inbalance in body cause cancer.

  Hormonal imbalance or estrogen excess causes breast cancer.

  Urinary bladder cancer is common in dye workers.

- **Important carcinogens and the organs affected :**

S.No.	Carcinogens	Affected Organs
i	Soot	Skin and lungs
ii	Cigarrete smoke (N-nitrosodimethylene)	Lungs
iii	Coaltar (3, 4-benzopyrine)	Skin and lungs
iv	Aflatoxin (metabolic product of fungi)	Liver
v	Cadmium oxide	Prostate gland
vi	Mustard gas (b)	Lungs
vii	Asbestos	Lungs
viii	Nickel and Chromium compounds	Lungs, Larynx
ix	Vinyl chloride	Liver
x	Diethyl stebesterol (DES)	Vagina
xi	Benzene	Blood, Bone marrow
xii	Arsenic	Liver, Lungs, Skin

Physical factors : Sharp teeth cause Tongue cancer

Kashmiri people keep 'Kangri' close to skin that cause skin cancer & this skin cancer is called **Kangri cancer**.

- **Radiation factors :** Cosmic rays, X-rays and U.V. rays cause cancer. There are 5 times more incidence of leukemia in Hiroshima & Nagasaki due to radiation effect of nuclear bombing.
- **Biological factor : Oncogenes** (cancer producing genes) and **oncovirus** cause cancer (HIV in AIDS.)

NVESTIGATION -

- **Blood examination :** Detection of the abnormal cells or cancerous cell in blood. Detection of the tumour marker like -feto protein in blood by blood examination.
- **Biopsy :** Cancerous tissue examination is called biopsy (Karyoplasmic index high)
- F.N.A.C. (Fine needle aspiration cytology)
- C-T scan, M.R.I., X-rays.

  X-ray of breast is called Mamography.

- **Pap smear :** It is used cervical carcinoma and detects cytological character of cancer.
- Modern techniques detect the molecular changes that occur in cancer cells; this enables an early diagnosis of cancer. Monoclonal antibodies against cancer-specific antigens are coupled to appropriate radioisotopes. These antibodies are then used for detection of cencer. (Most common radioisotope for diagnosis of cancer is technetium - 99)

TREATMENT :

- **Surgery :** By removing the entire cancerous tissue and infected lymph nodes.
- **Radiation :** Cobalt therapy (Co-60), X-ray radiations are given. These radiations destroy the rapidly dividing cells.

- **Chemotherapy :** Many anti-cancerous drugs like **Drug mechanism :**
  - G Vincristine (weed - cantharanthus roseus = Vinca rosea)
  - G Vinblastin (weed - cantharanthus roseus = Vinca rosea)
  - G Cyclophosphamide
- **Inhibit the DNA synthesis in cell cycle** of cancerous cell but this has side effects.
- **Immuno therapy - Monoclonal antibodies, vaccine and -interferon** are given in it

One of the recent approaches of cancer treatment involves augmentation of natural anti-cancer immunological defence mechanisms. Monoclonal antibodies have been used in various ways, e.g., radioimmunotherapy, etc., for treatment of cancer. Research is in progress to develop cancer vaccines.

Most of cancer are treated by combination theraphy of surgery, radiation and anti cancerous drug.