Oncology

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Content

- Cancer definition
- Character
- Epidemics
- Pharmacist role
- Genes

Definition

- Broad group of diseases involving unregulated cell growth.

- Cancer is a multi-step process during which cells undergo profound metabolic and behavioural changes, leading them to proliferate in an excessive and untimely way, to escape surveillance by the immune system

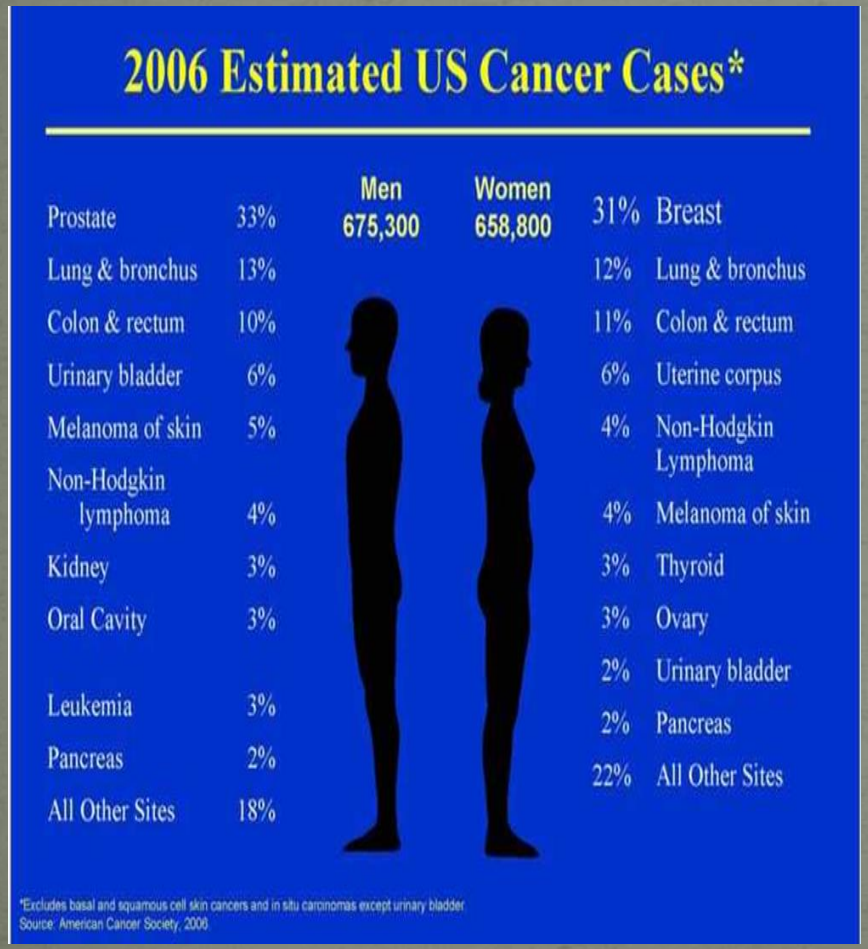
- Such cells cannot respond to normal regulatory mechanisms
- “Out law” clones

Character

- Grow uncontrollably.
- Local invasion
- Metastasis

(lymphatic system or bloodstream)

Epidemics



- Incidence
- Cause of death

Pharmacist role

- The pharmacist is vital to maximizing the treatment's effectiveness by

Industrial role for investigations for new drugs

Choice of drug regimen and therapeutic drug monitoring

Providing drug information related to anticancer drugs

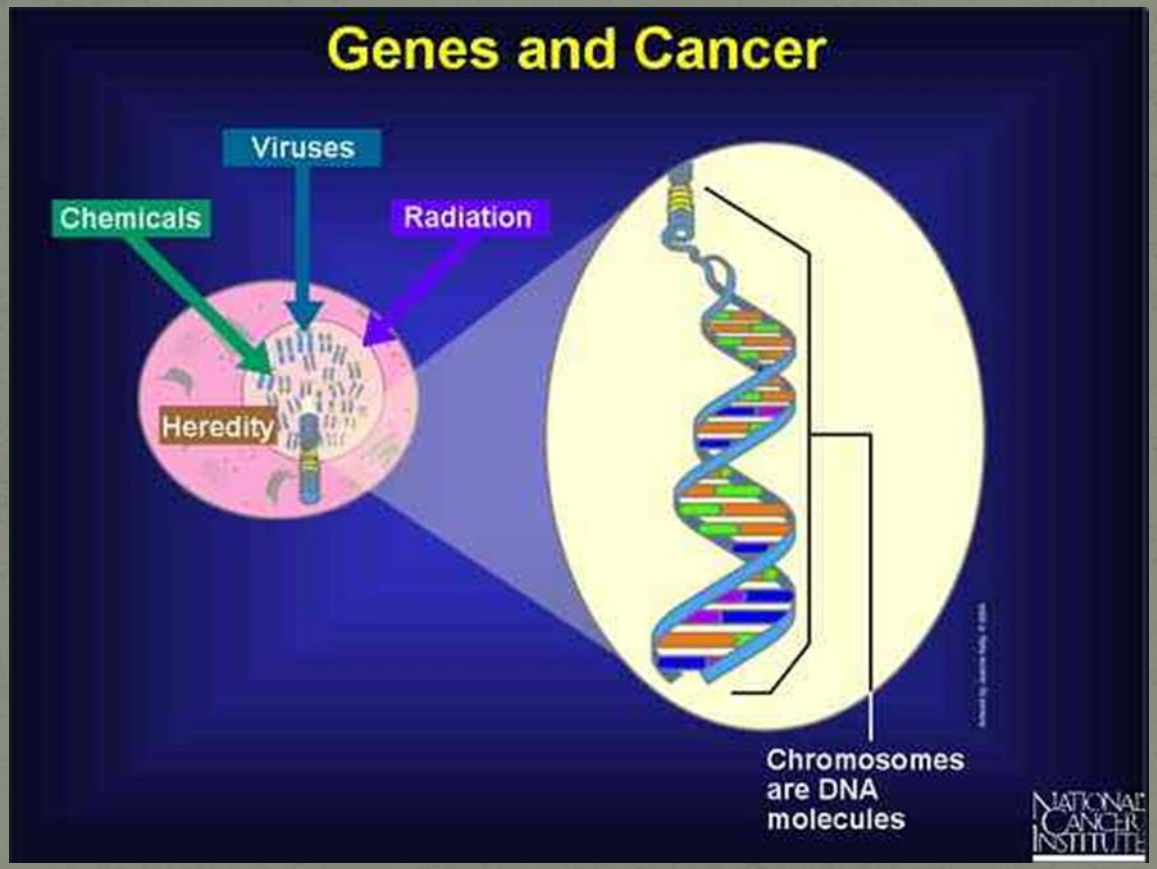
Monitoring of patient with providing supportive care issues as:
Nutritional support
Educating patients how and when to take.

Possible drug interactions

Actively monitoring regimen compliance

Monitor and manage S.E and toxicity (N,V, ……)

Carcinogens



Carcinogenesis

A. Initiation

Exposure to carcinogen → genetic damage

B. Promotion

- **Growth of mutated or initiated cells**

C. Conversion

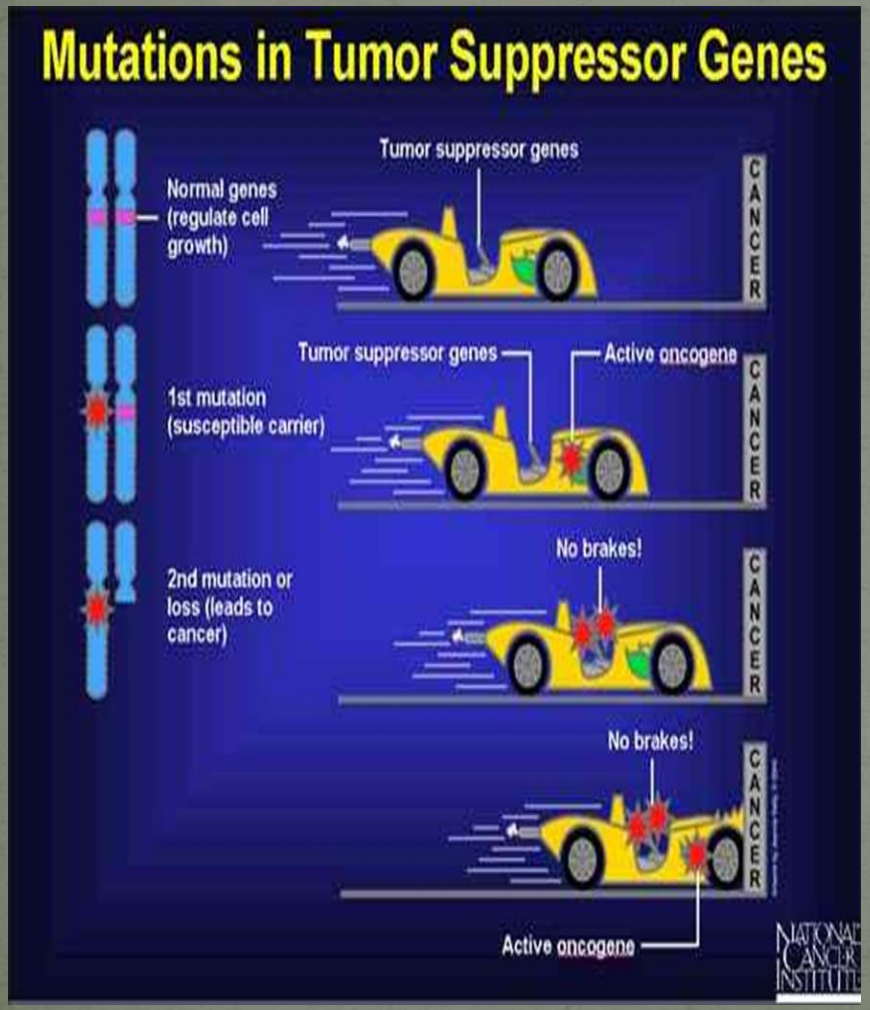
- **Mutated or initiated or preneoplastic cells → cancerous cells**

D. Progression

Cancerous cells → proliferation → local tissue invasion → metastasis

- This occur with continuous exposure to carcinogen

Carcinogenic genes



- protoncogene
- tumor suppressor gene

- metastatic genes

(nm23 -H1& H2 for breast cancer)

Most initiating mutations affect protoncogenes or tumor suppressor genes. Protoncogenes code for a variety of growth factors, growth factor receptors, enzymes, or transcription factors that promote cell growth and/or cell division.

Mutated versions of protoncogenes that promote abnormal cell proliferation are called **oncogenes**

Mechanisms of cancer development

- Genetic mutation

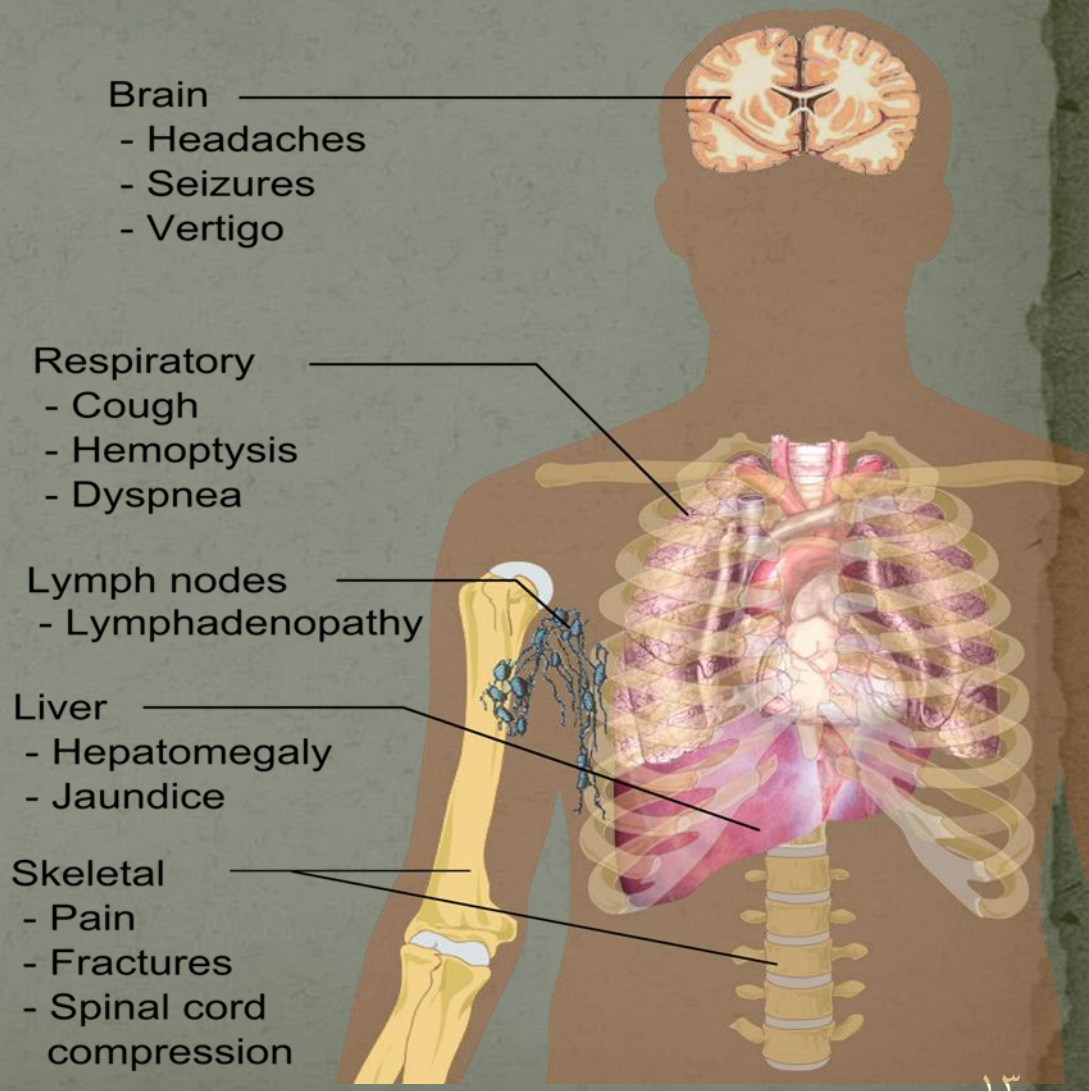
(in sequence by point mutation, deletion or translucation)

- Epigenetic

(conformation) such as DNA cyt-methylation
Colorectal cancer

Signs &symptoms

- Non specific



Tumor growth

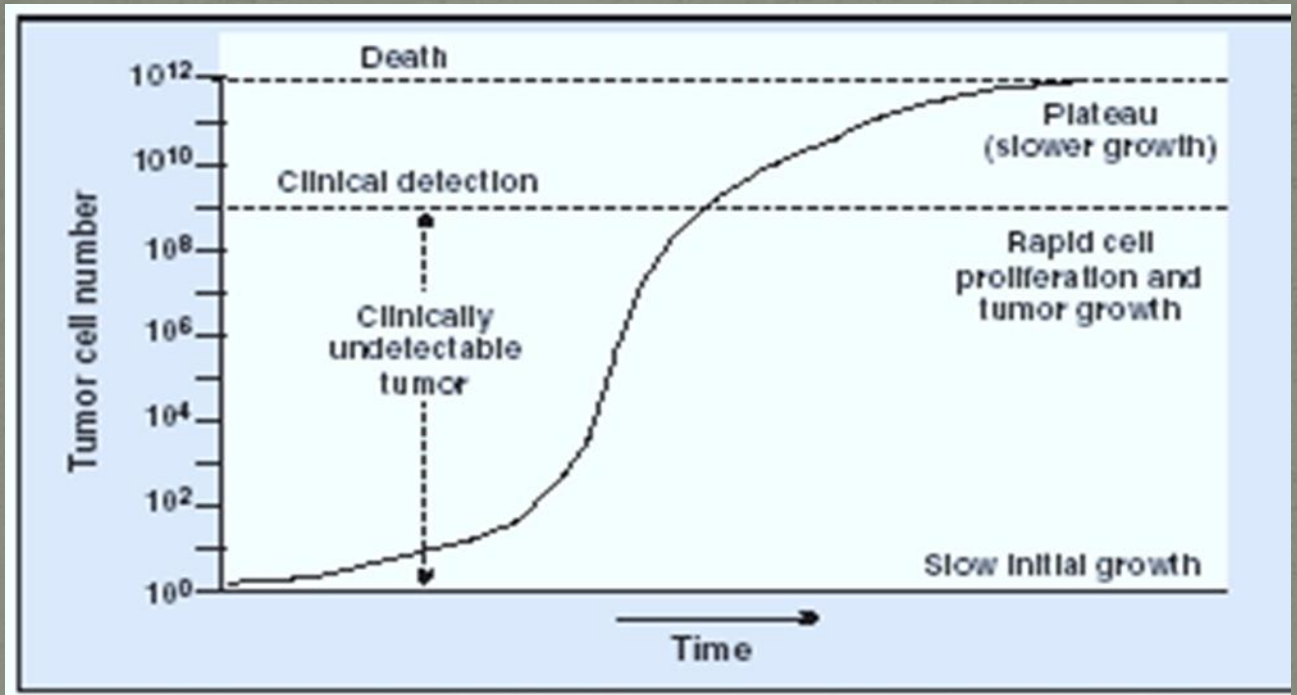
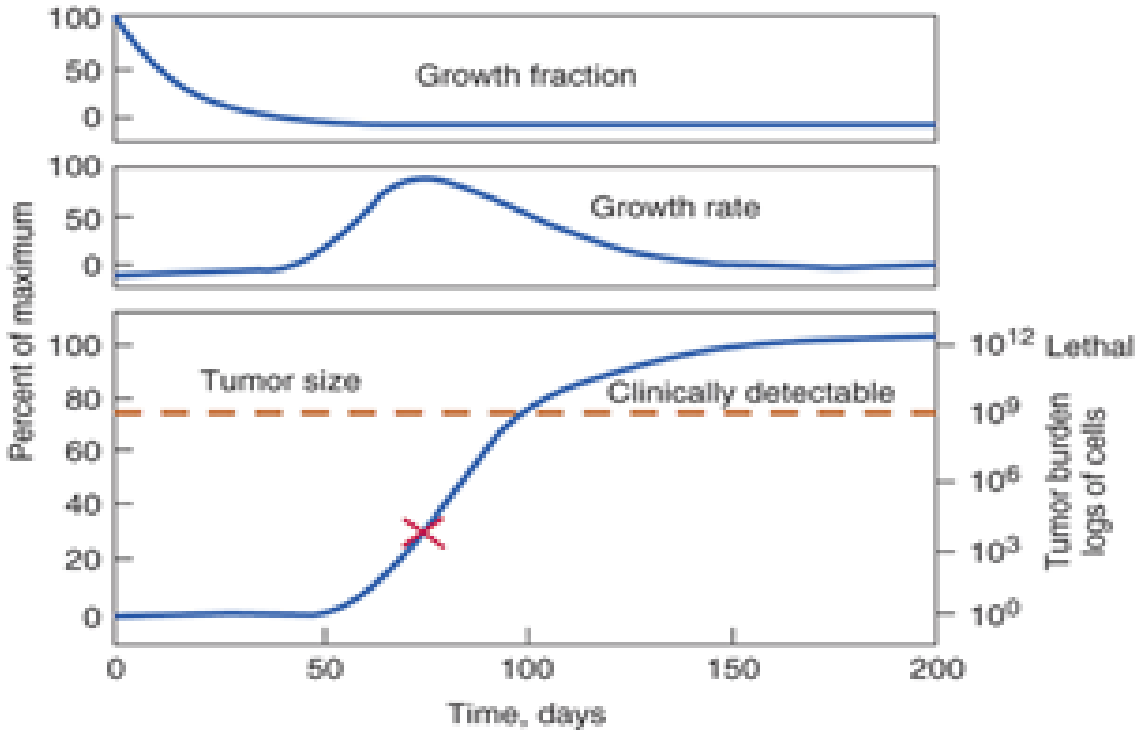
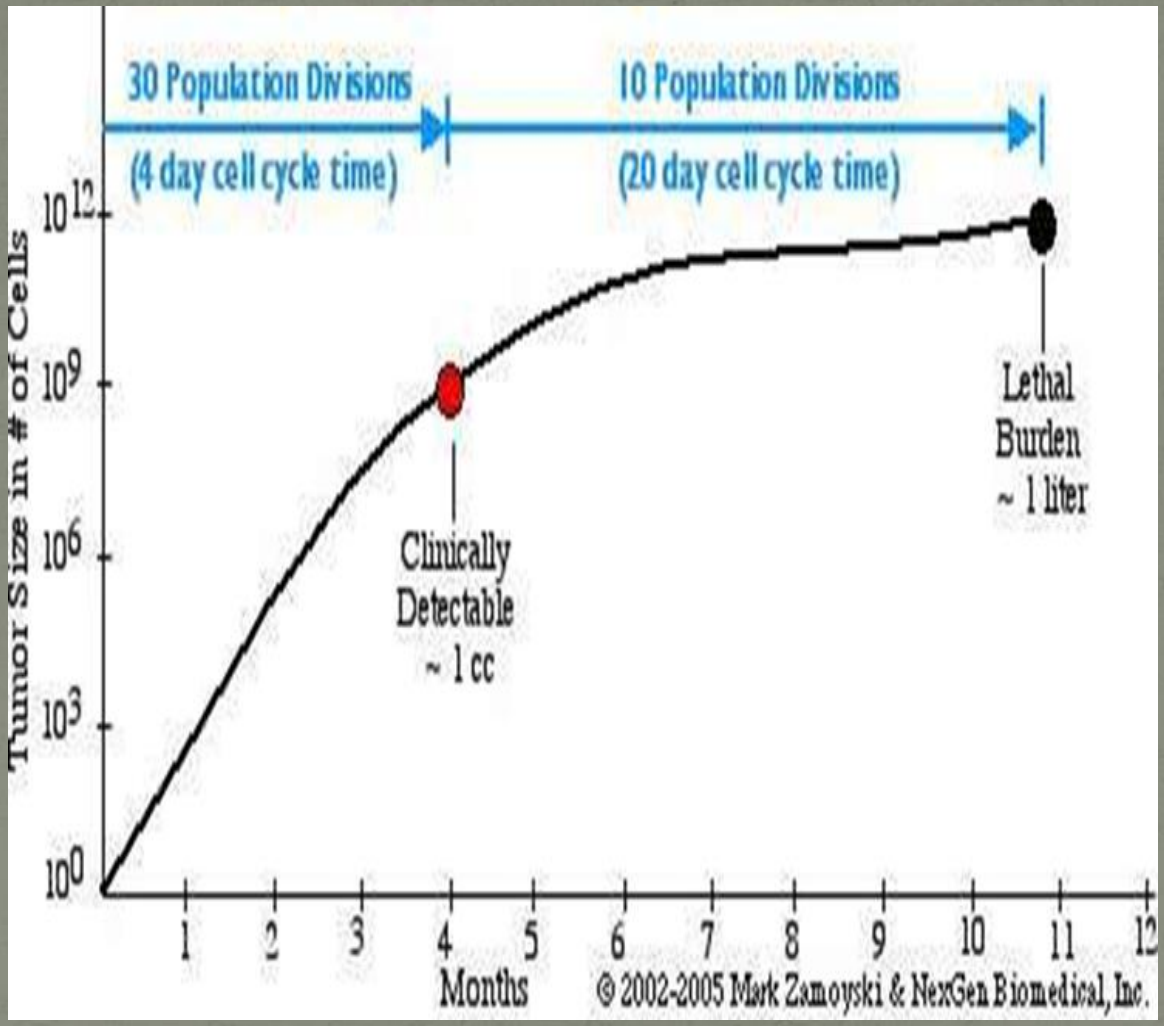


Figure 2: Gompertzian Model of Tumor Growth—In this model, which applies to the majority of tumor types, tumors exhibit three distinct growth patterns throughout their life cycle.


100
50
0
Growth fraction
100
50
0
Growth rate
Percent of maximum
100
80
60
40
20
0
Tumor size
Clinically detectable
10^{12}
Lethal
10^{9}
10^{6}
10^{3}
10^{0}
Tumor burden
logs of cells
0
50
100
150
200
Time, days


30 Population Divisions
(4 day cell cycle time)
10 Population Divisions
(20 day cell cycle time)
Tumor Size in # of Cells
10^{12}
10^{9}
10^{6}
10^{3}
10^{0}
Clinically
Detectable
~ 1 cc
Lethal
Burden
~ 1 liter
1 2 3 4 5 6 7 8 9 10 11 12
Months
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- **Cells kill theory**
- **The cell kill hypothesis states that a certain percentage of cancer cells not a certain number will be killed with each course of chemotherapy**

- **According this theory, tumor burden never reaches to absolute zero.**

- **Fortunately tumor consists of less than 10^4 cells can be eliminated by host immune system and this may lead to cure**

- **The limitations of cell kill hypothesis concern:**

1. **It assumes that all cancer cells are equally responsive**
2. **It neglects drug resistance**
3. **It assumed that metastasis doesn't occur**

Tumor types

Benign

- **Localized mass**
- **Encapsulated mass**
- **No tissue invasion**
- **No metastasis to distant sites**
- **No recurrence after ablation**
- **Slow growth**

Malignant

- **not localized**
- **Tissue invasion**
- **Metastasis to distant sites**
- **Relapse after remission**
- **Anaplasia (loss function)**

Tumor origin

It arises From any of the four basic tissue types

- **Epithelial tissue (skin, breast and internal organs) → carcinoma**
- **Connective tissue as blood or bone → sarcoma**
- **Glandular tissues → adenocarcinoma**
- **Nervous and , muscular tissues → neuroplastoma**

Thanks