

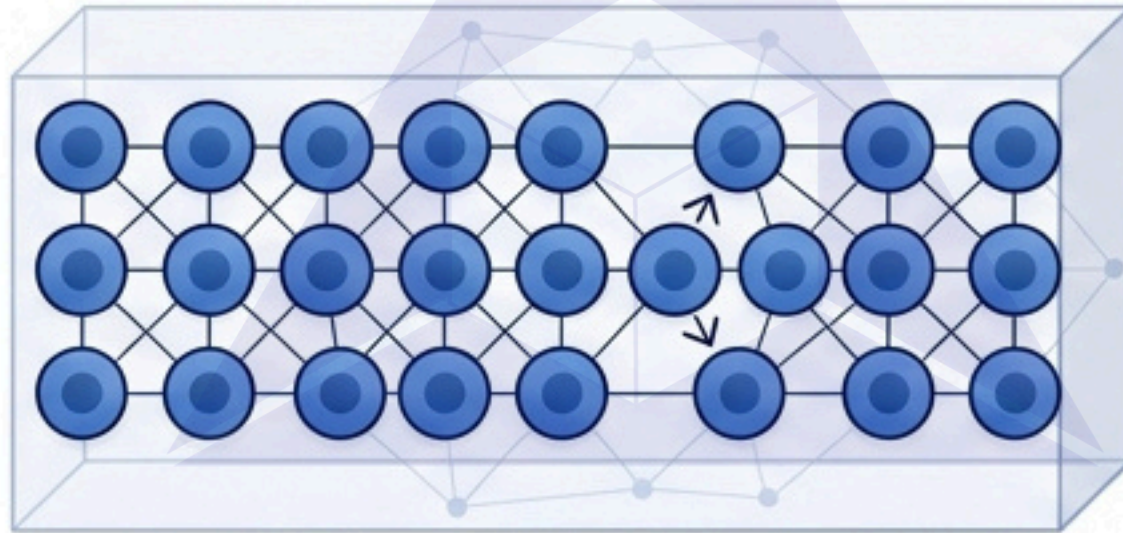
CHAPTER 7.4 | HUMAN HEALTH AND DISEASE

CANCER: THE CLINICAL BLUEPRINT

A systemic breakdown of oncogenic transformation, diagnostic vectors, and multi-modal treatment interventions.

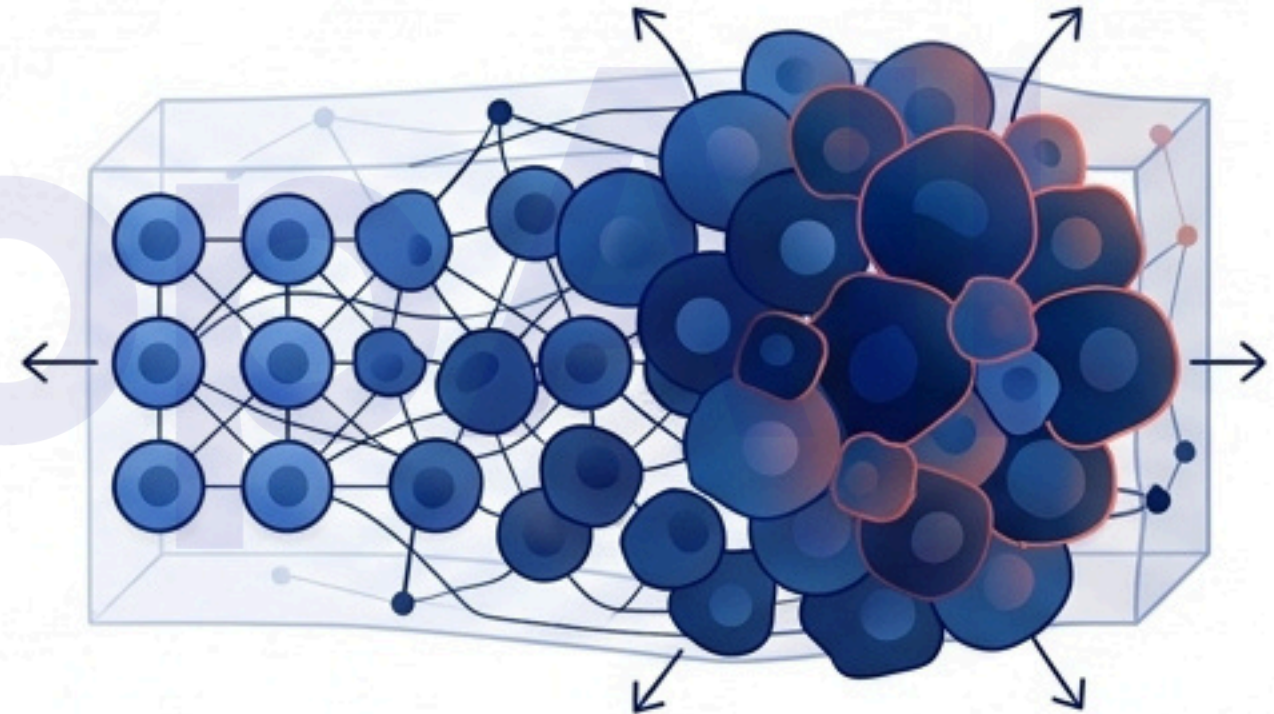
The Loss of Regulatory Mechanisms

Contact Inhibition



Healthy cells demonstrate regulated growth; physical contact with other cells inhibits uncontrolled division.

Oncogenic Transformation



Cancer cells lose contact inhibition. They continue to divide relentlessly, giving rise to unorganized masses of cells (tumours).

Tumour Typology & The Threat of Spread

Benign Tumours

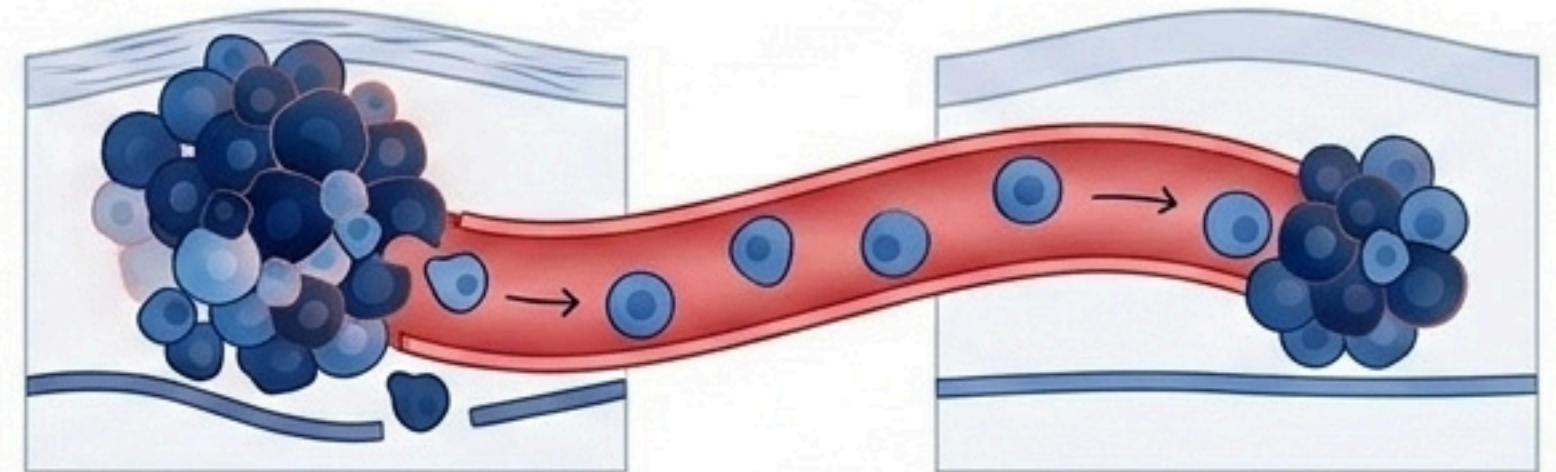
- Confined to original location.
- Does not spread.
- Causes little local tissue damage.

Malignant Tumours

- Neoplastic (tumour) cells.
- Proliferate rapidly.
- Invade and damage surrounding normal tissues.
- Starve normal cells by competing for vital nutrients.

Metastasis (The Most Feared Property)

Cells sloughed from malignant tumours reach distant sites via the bloodstream. Wherever they lodge, they initiate the growth of new, secondary tumours.





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Agents of Neoplastic Transformation (Carcinogens)



Physical Agents

Induce DNA damage leading to transformation. Includes ionising radiations (X-rays, gamma rays) and non-ionising radiations (UV).



Chemical Agents

Chemical carcinogens present in the environment. Tobacco smoke is identified as a major cause of lung cancer.



Biological Agents

Oncogenic viruses possess viral oncogenes. Furthermore, normal cells cellular oncogenes (c-onc) or proto-oncogenes, which, when activated under certain conditions, lead to oncogenic transformation.

Multi-Vector Detection & Diagnosis

Biopsy & Histopathology

A piece of suspected tissue is cut into thin sections, stained, and examined under a microscope by a pathologist. Includes blood and bone marrow tests for increased cell counts (e.g., leukemias).

Radiography & CT

Radiography uses standard X-rays. CT (Computed Tomography) uses X-rays to generate a three-dimensional image of the internal structures of an object.

MRI (Magnetic Resonance Imaging)

Uses strong magnetic fields and non-ionising radiations to accurately detect pathological and physiological changes in living tissue.

Antibodies & Genetics

Antibodies against cancer-specific antigens. Molecular biology techniques detect inherited susceptibility genes, allowing patients to proactively avoid specific carcinogens.

Modern Treatment Modalities



Surgery

Physical removal of the localized tumour mass.

Radiotherapy

Lethal irradiation of tumour cells, executed with precise care to protect the surrounding normal tissues.

Chemotherapy

Application of drugs to kill cancerous cells (some specific to particular tumours). **Side Effects:** Majority of drugs cause hair loss and anemia.

Immunotherapy

Tumour cells actively avoid detection. Patients are given biological response modifiers—specifically α -interferon—which activate the immune system to help destroy the evasive tumour.

Combination Therapy is Standard

Key Takeaways: Chapter 7.4

● The Mechanism

Cancer is fundamentally the breakdown of regulatory cell growth. Normal cells exhibit contact inhibition; cancer cells lose this, transforming into continuously dividing neoplastic cells.

● The Danger

Tumours are benign (localized) or malignant (invasive). The most lethal property is metastasis—the ability of malignant cells to slough into the bloodstream and seed new tumours in distant organs.

● The Arsenal

Management relies on early, multi-vector detection (Biopsy, CT, MRI, genetics) paired with combination therapies. Immunotherapy using α -Interferon represents a crucial method to overcome tumour immune evasion.



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