

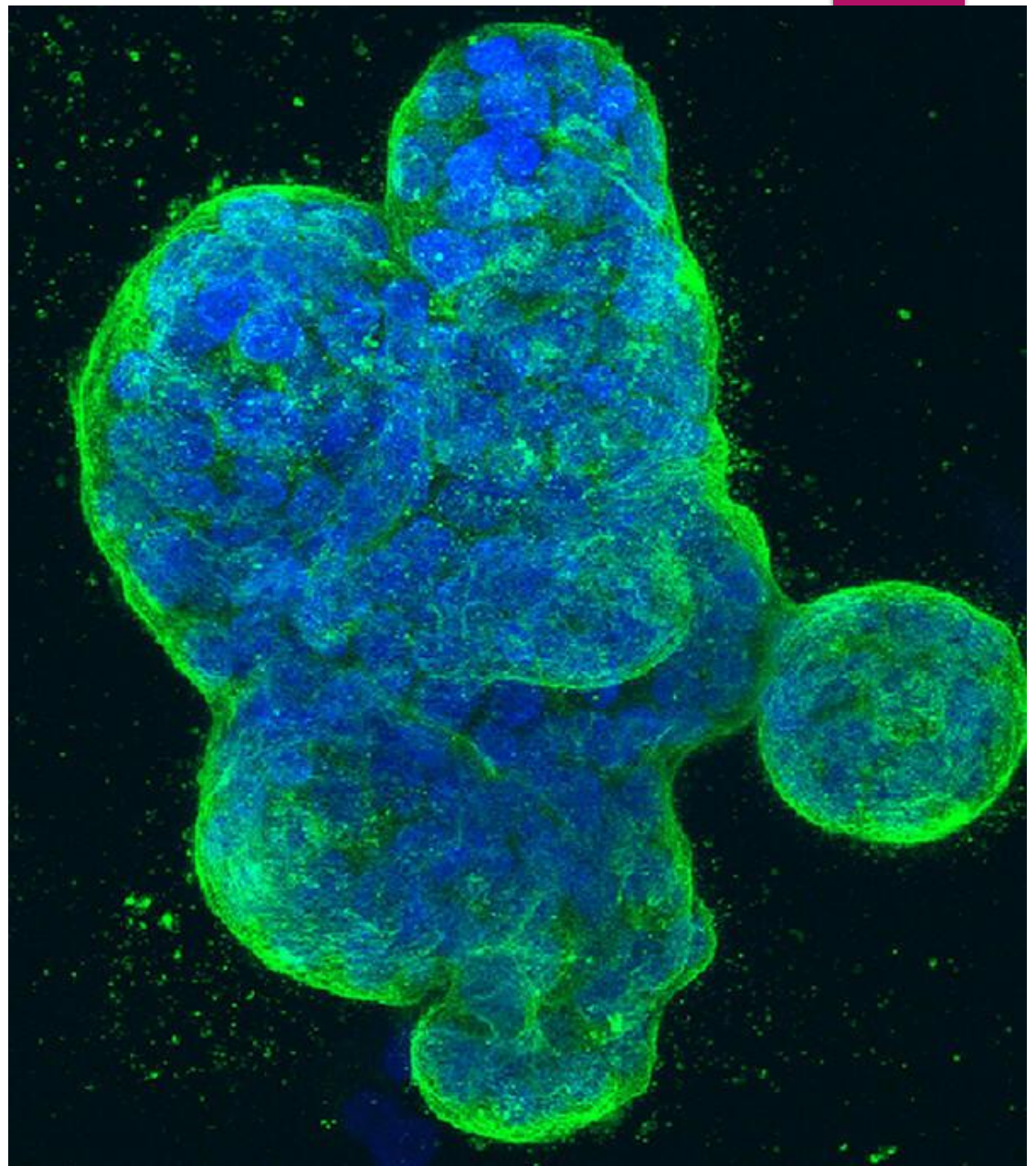
The background features a dark blue color scheme with several glowing, semi-transparent 3D models of cells or molecular structures. These models are spherical and have a textured, layered appearance, resembling a woven or fibrous surface. Scattered throughout the background are various chemical structures and molecular formulas in a lighter blue or white color, including amino acids, nucleotides, and complex organic molecules. The overall aesthetic is scientific and futuristic.

## Cellular transformation to watch it up close

Dr Mona Quenawy

AIN SHAMS university

- ▶ Outline
- ▶ Generic signaling pathway
- ▶ Cell division
- ▶ Carcinogenesis and genomic control
- ▶ the difference between Benign and malignant tumor
- ▶ Scientific terminology
- ▶ Immunotherapy



NCI Center for Cancer Research, Tom Misteli, Karen Meaburn

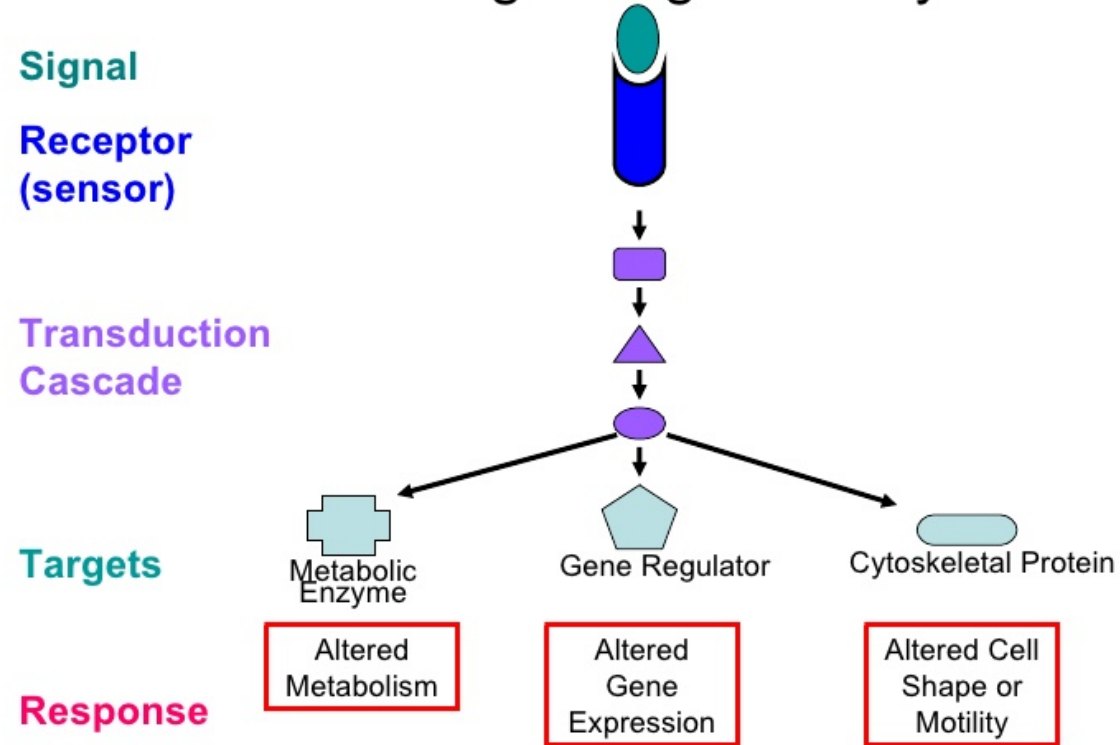
cancer  
theory



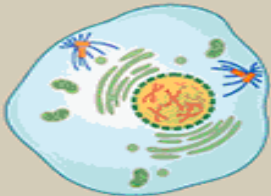
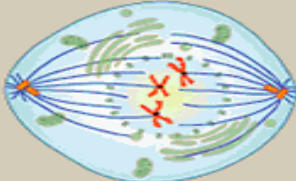
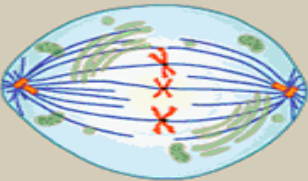
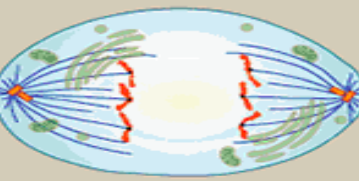
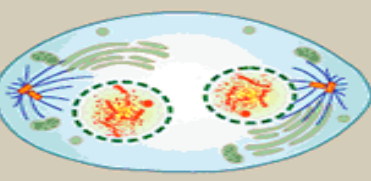
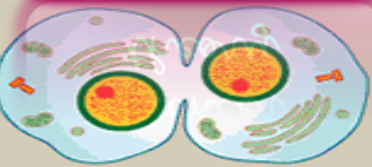
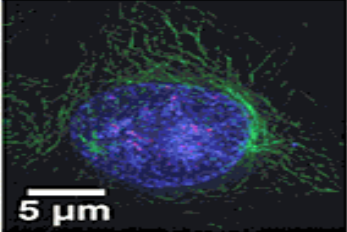
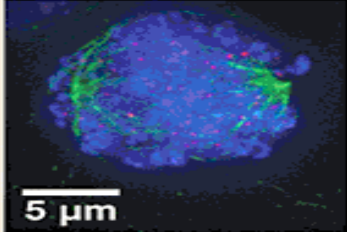
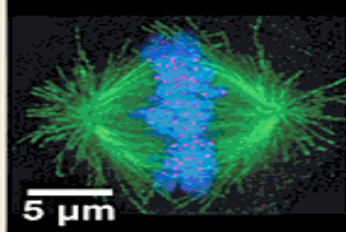
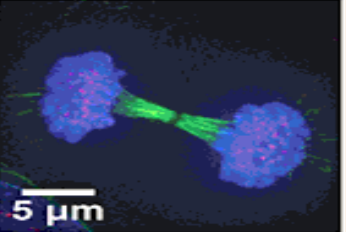
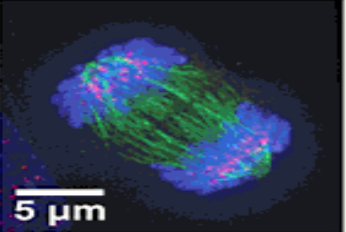
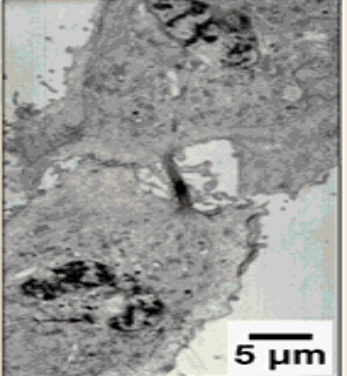
Nearly two trillion cells divide every day

▶ <https://youtu.be/46Xh7OFkkCE>

# Generic Signalling Pathway



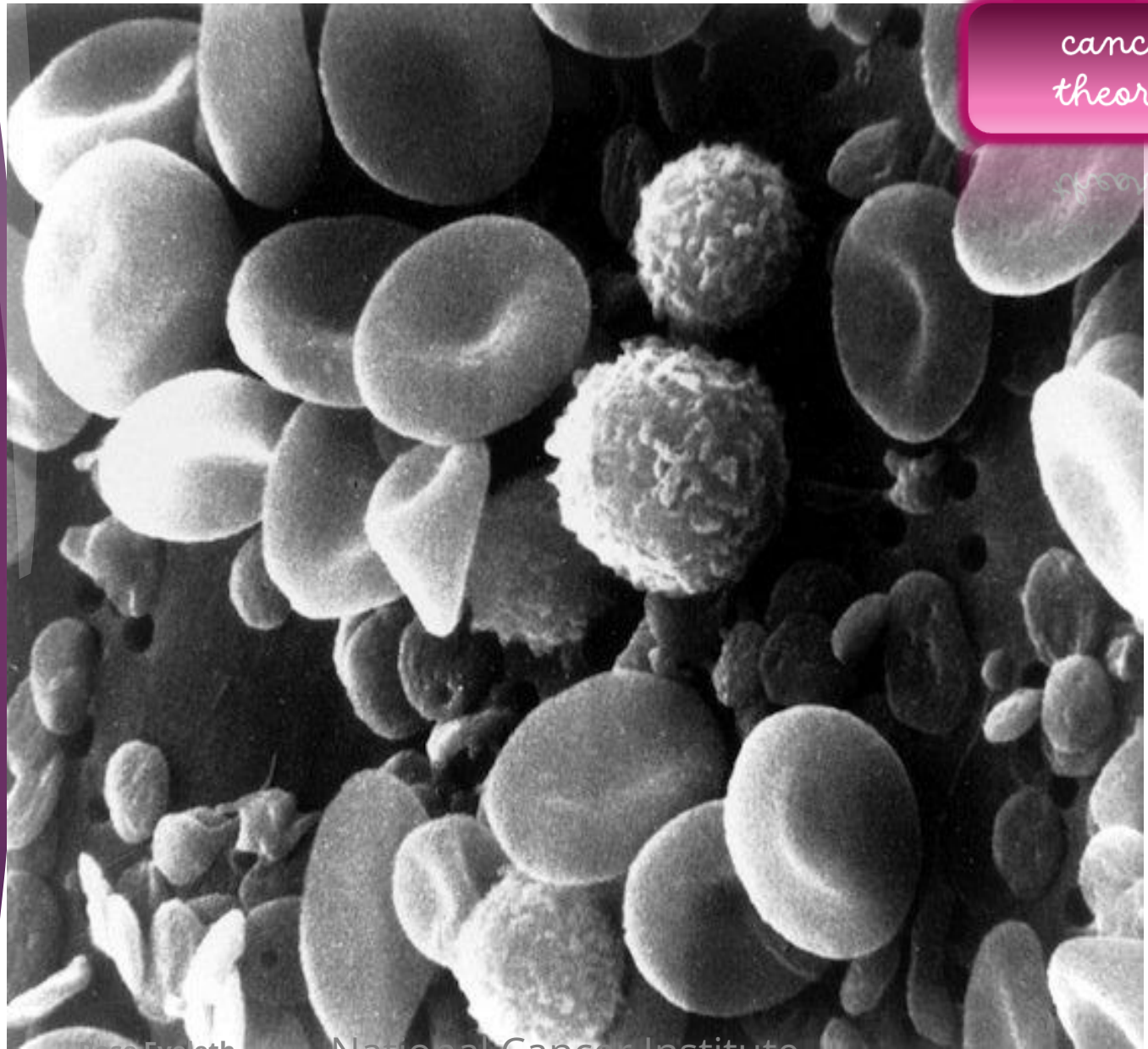
Adapted from Molecular Biology of the Cell, (2002), 4th edition, Alberts et al

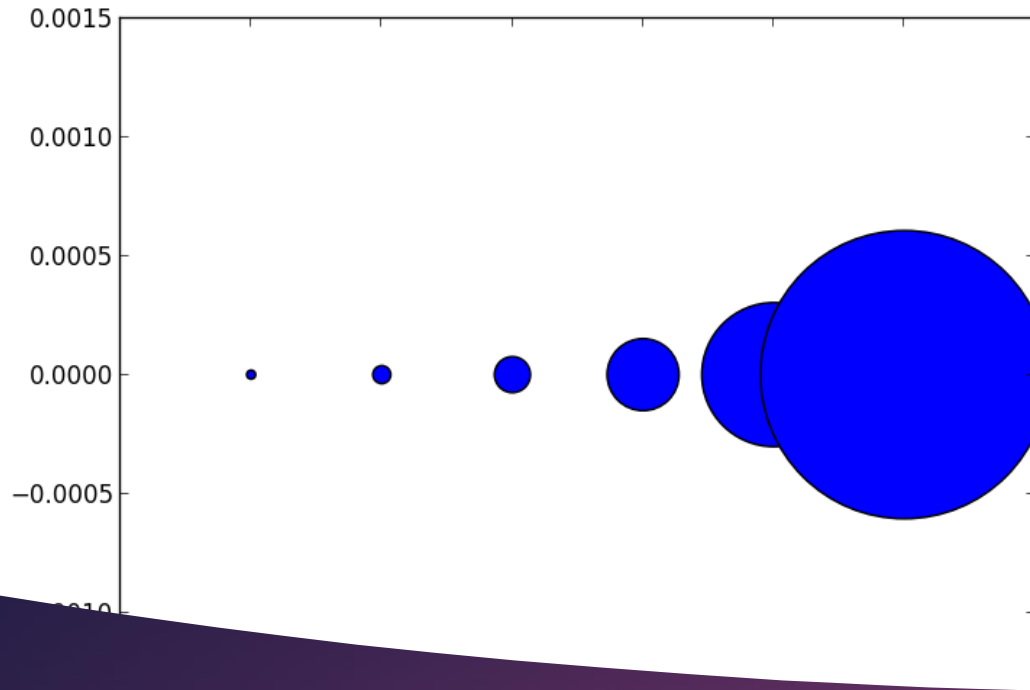
Prophase	Prometaphase	Metaphase	Anaphase	Telophase	
					
<ul style="list-style-type: none"> <li>• Chromosomes condense and become visible</li> <li>• Spindle fibers emerge from the centrosomes</li> <li>• Nuclear envelope breaks down</li> <li>• Centrosomes move toward opposite poles</li> </ul>	<ul style="list-style-type: none"> <li>• Chromosomes continue to condense</li> <li>• Kinetochores appear at the centromeres</li> <li>• Mitotic spindle microtubules attach to kinetochores</li> </ul>	<ul style="list-style-type: none"> <li>• Chromosomes are lined up at the metaphase plate</li> <li>• Each sister chromatid is attached to a spindle fiber originating from opposite poles</li> </ul>	<ul style="list-style-type: none"> <li>• Centromeres split in two</li> <li>• Sister chromatids (now called chromosomes) are pulled toward opposite poles</li> <li>• Certain spindle fibers begin to elongate the cell</li> </ul>	<ul style="list-style-type: none"> <li>• Chromosomes arrive at opposite poles and begin to decondense</li> <li>• Nuclear envelope material surrounds each set of chromosomes</li> <li>• The mitotic spindle breaks down</li> <li>• Spindle fibers continue to push poles apart</li> </ul>	<ul style="list-style-type: none"> <li>• Animal cells: a cleavage furrow separates the daughter cells</li> <li>• Plant cells: a cell plate, the precursor to a new cell wall, separates the daughter cells</li> </ul>
 <p>5 μm</p>	 <p>5 μm</p>	 <p>5 μm</p>	 <p>5 μm</p>	 <p>5 μm</p>	 <p>5 μm</p>
<p>MITOSIS</p>					



<https://youtu.be/DwAFZb8juMQ>

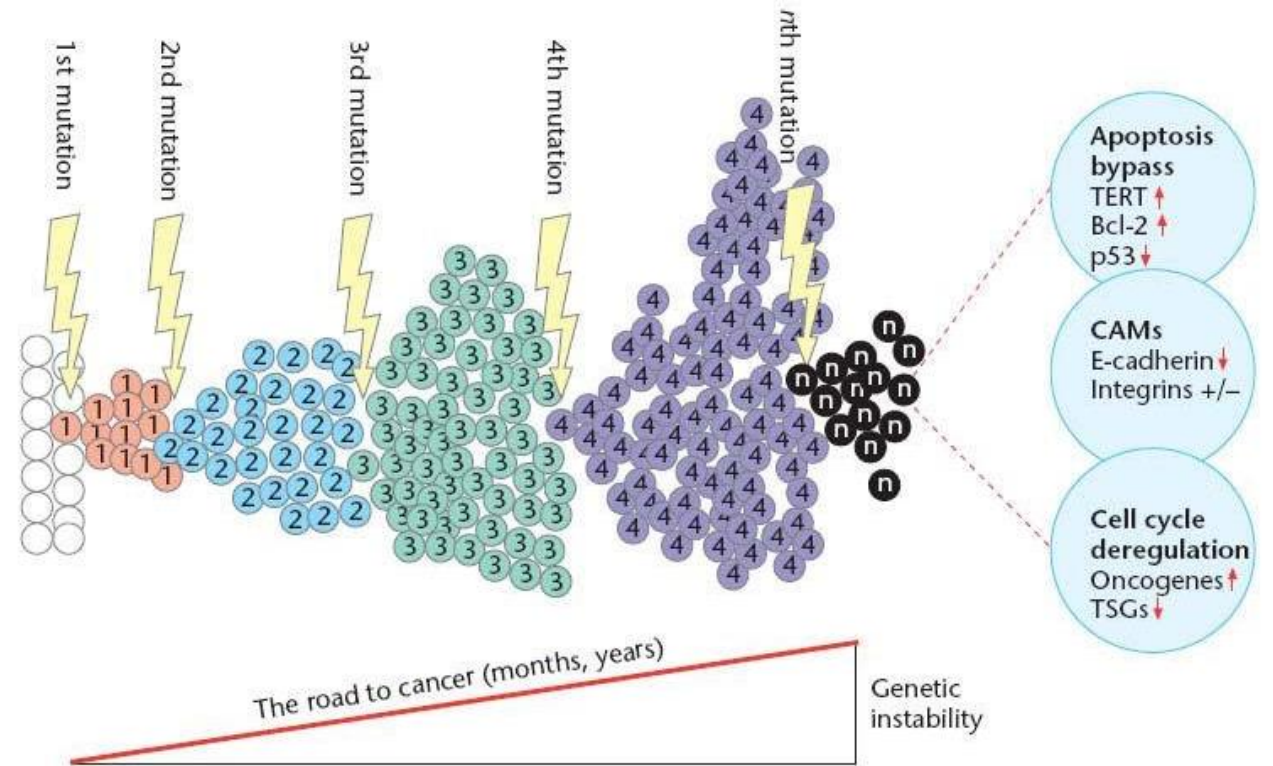
- ▶ For cancer cell
- ▶ What is The concept of tumor doubling time



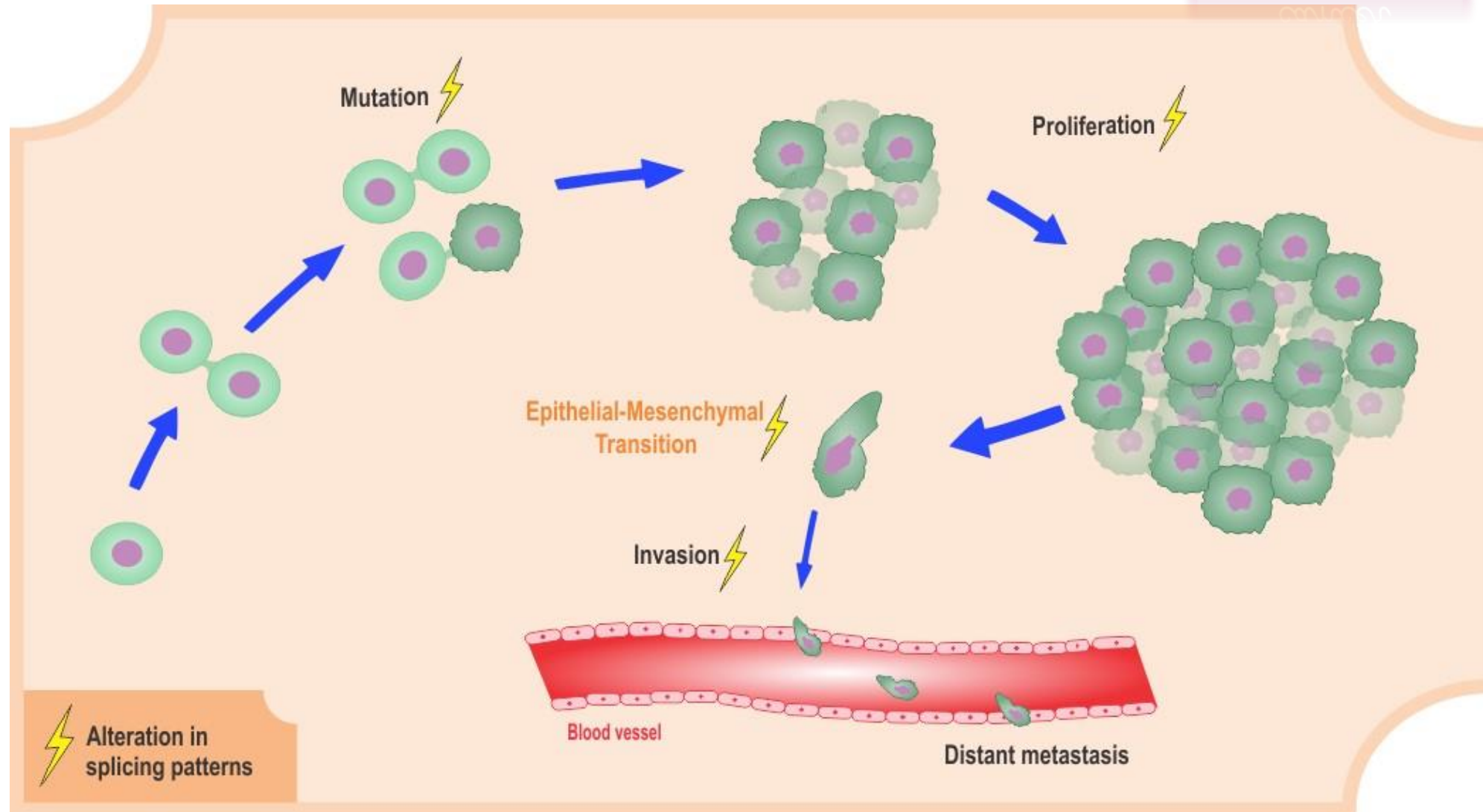


- ▶ Tumor doubling time (DT) is defined by the number of days required for a tumor to double its volume.
- ▶ A shorter DT indicates a faster tumor growth rate. The duration of the cell cycle is similar in tumors and healthy tissues, but tumors present a higher proportion of cells undergoing mitosis

► Genetic instability with frequent mutation enhance tumor progress

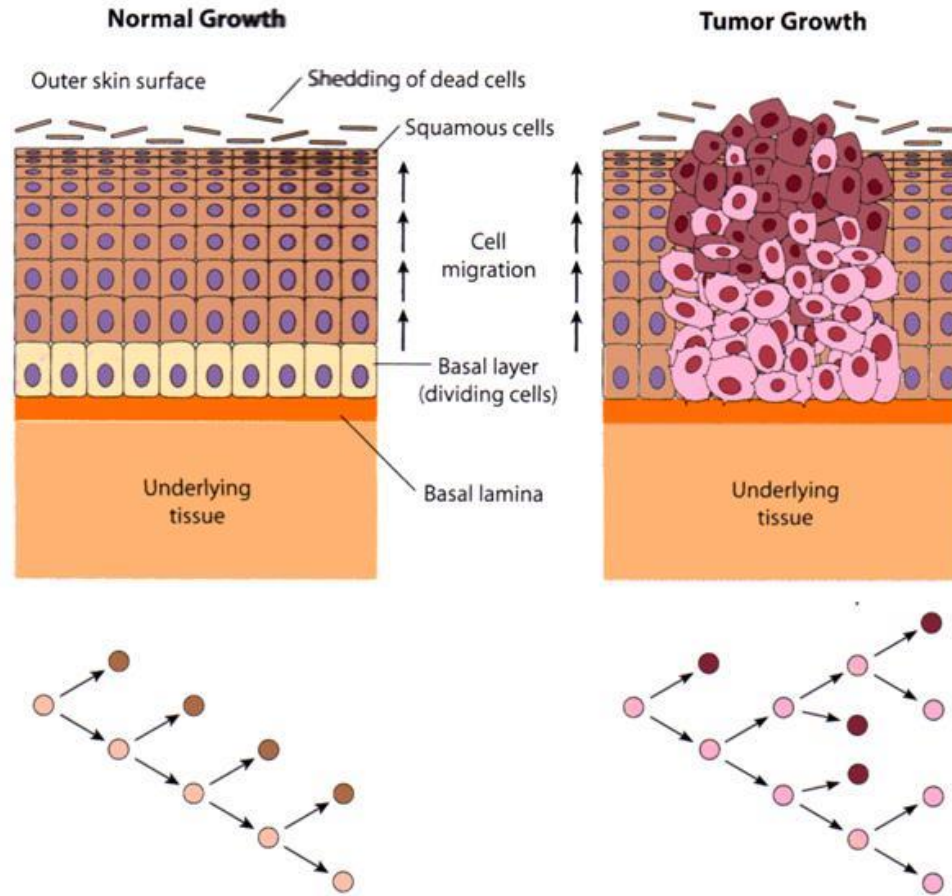


► mutation as driver for the process



# Comparison of normal and neoplastic growth in the epithelium of the skin

cancer theory



In normal skin, each cell division gives rise to one cell that retains the capacity to divide and one that differentiates.

# BENIGN AND MALIGNANT TUMORS

cancer  
theory

## MALIGNANT

NON ENCAPSULATED

INVASIVE

POORLY DIFFERENTIATED

COMMON

RAPID GROWTH

ANAPLASTIC TO

VARYING DEGREES

METASTASES

## BENIGN

USUALLY ENCAPSULATED

USUALLY, NONINVASIVE

HIGHLY DIFFERENTIATED

MITOSES RELATIVELY

SLOW GROWTH

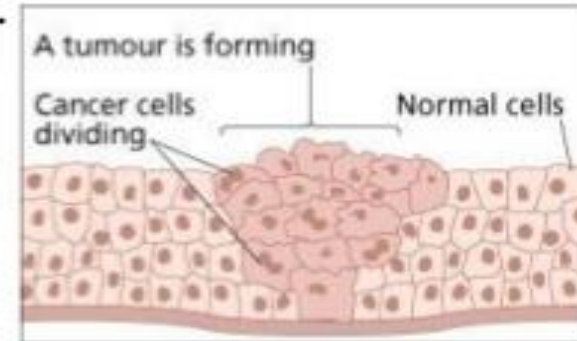
LITTLE OR NO ANAPLASIA

NO METASTASES

RARE MITOSES

## Characteristics of cancer cells

1. uncontrolled proliferation
2. abnormal nucleus
3. loss of anchorage
4. disorganized multilayer (loss of contact inhibition)
5. forms tumor
6. undergoes metastasis & angiogenesis
7. lack of differentiation into specialized cells.
8. increased rate of anaerobic glycolysis



# Terms related to normal and abnormal cell growth

**Anaplasia:** Loss of differentiation of cells and/or tissues

**Aneuploidy:** Possessing an abnormal number of chromosomes

**Carcinoma:** Malignant neoplasm of endodermal or ectodermal origin

**Dysplasia:** Abnormal tissue development

**Hyperplasia:** Increased number of cells in a tissue

**Hypertrophy:** Increase in the size of a tissue

**Metastasis:** Growth of cells distant from the site of origin

**Neoplasm:** An altered, relatively autonomous tissue growth

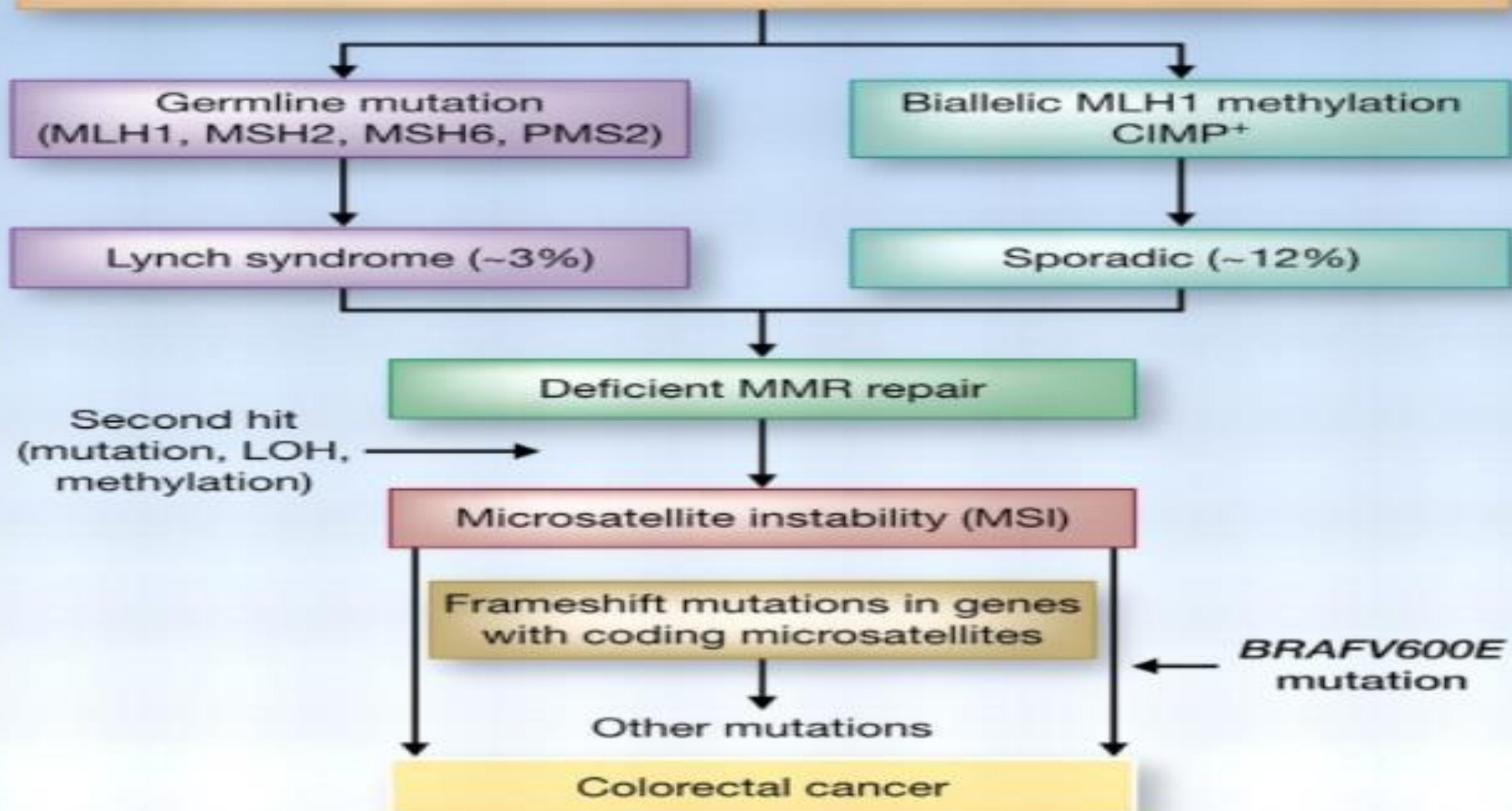
**Papilloma:** Benign epithelial tumor

**Sarcoma:** Malignant neoplasm of connective tissue origin

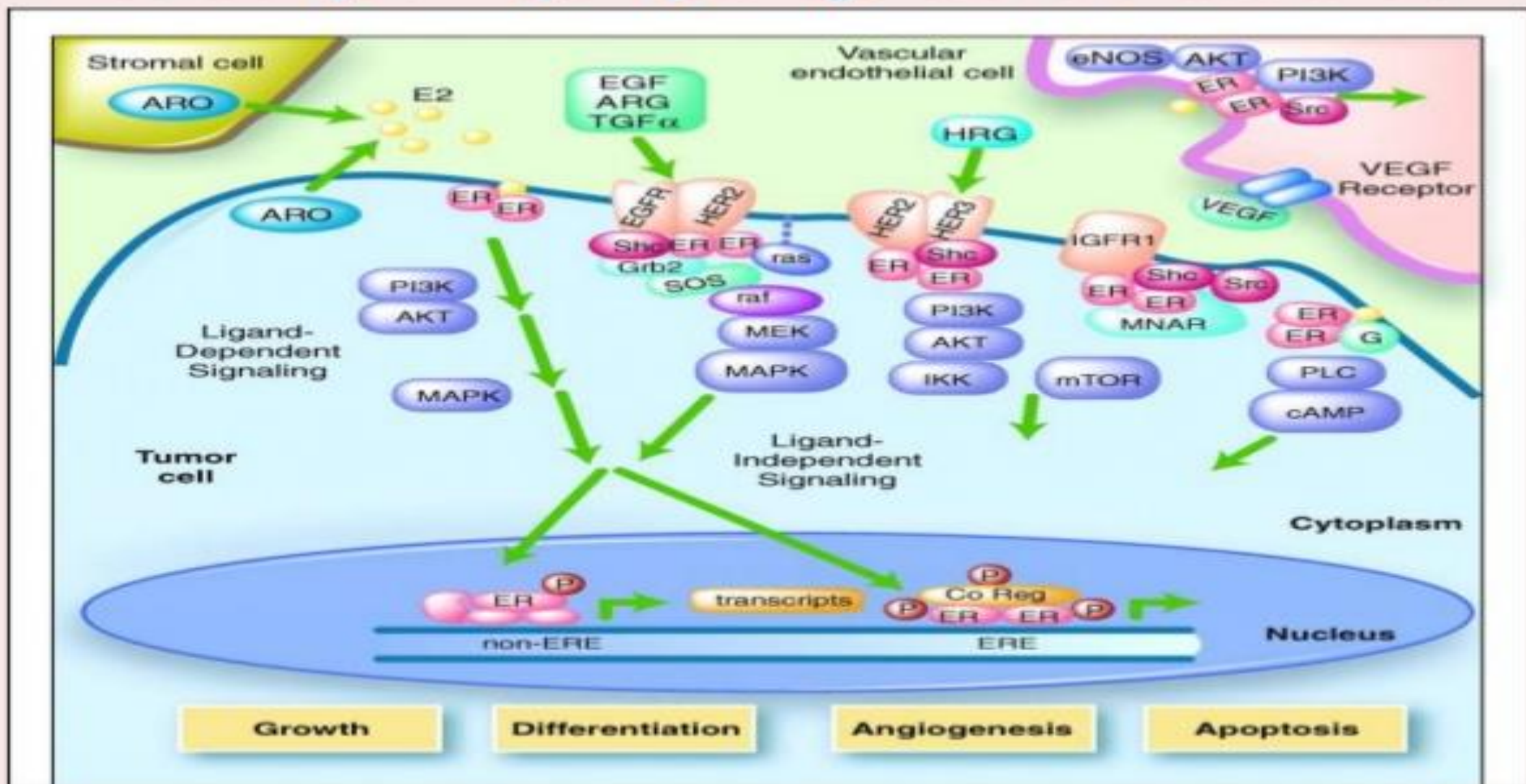


The features of colorectal cancer and breast cancer  
on the molecular basics

# Pathways to mismatch repair deficiency in colorectal cancer



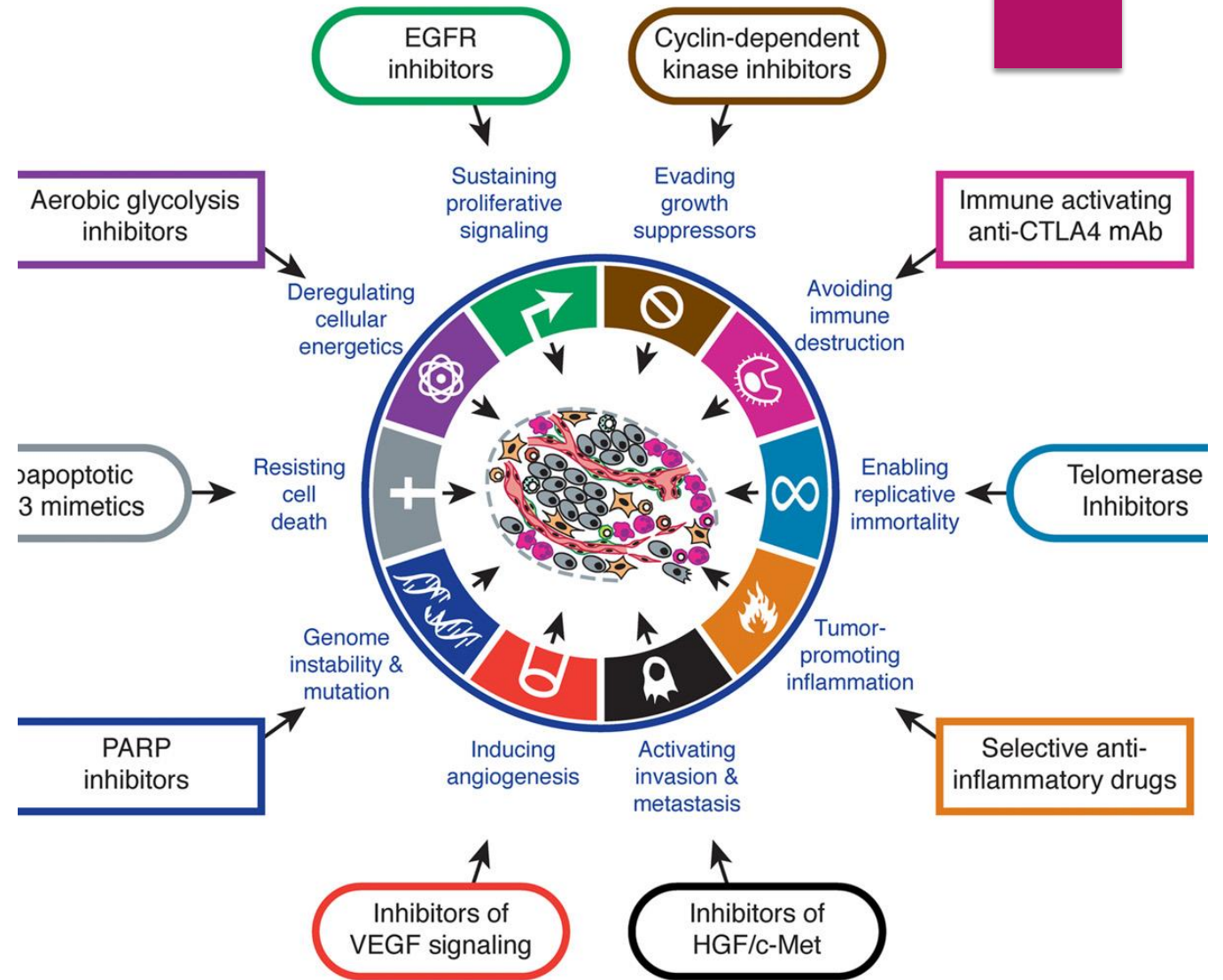
# Molecular pathways in pathogenesis of breast cancer



The hallmark of cancer

the ability to grow invade and metastasize

▶ HOW COULD WE EXPLOIT EVERY PATHWAY IN THE NEW TREATMENT ERA

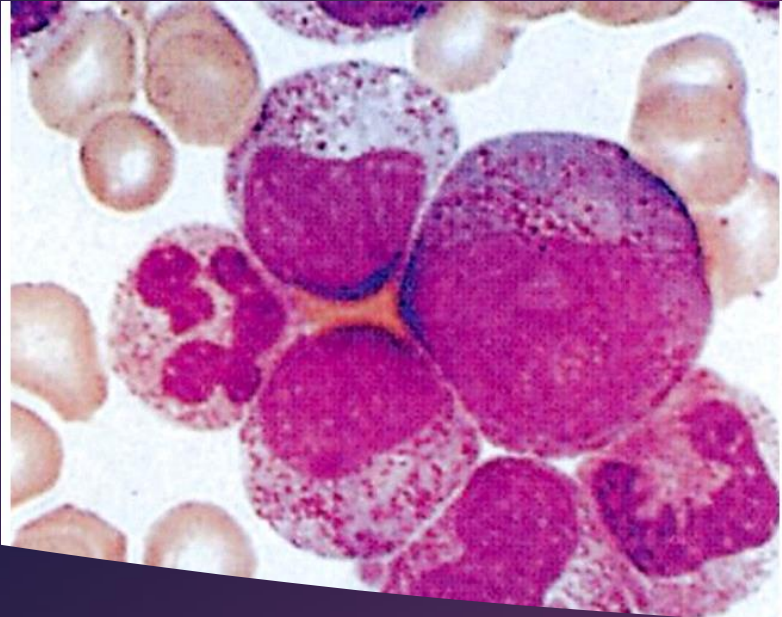


# Classification of Human Tumors by Tissue Type

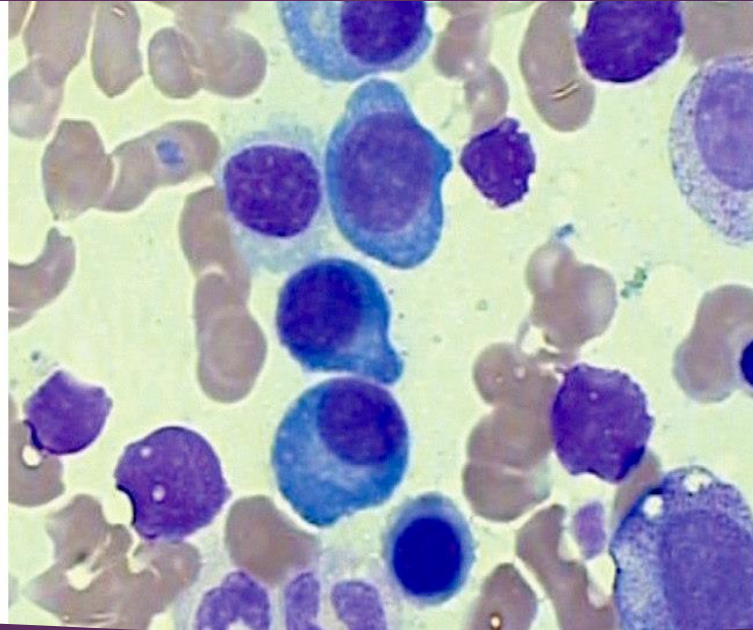
cancer theory

Tissue of Origin	Benign	Malignant
▶ Epithelium		
▶ surface epithelium	papilloma	carcinoma
▶ glandular epithelium	adenoma	adenocarcinoma
▶ Connective tissue		
▶ fibrous tissue	fibroma	fibrosarcoma
▶ bone	osteoma	osteosarcoma
▶ Endothelial tissue		
▶ blood vessels	hemangioma	hemangiosarcoma
▶ lymph vessels	lymphangioma	lymphangiosarcoma

▶ Microscopic features for tumor cells



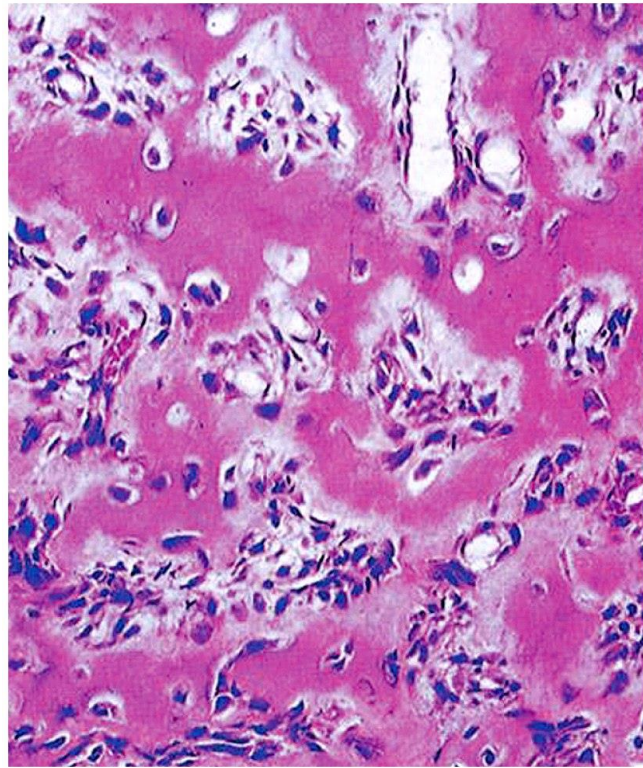
chronic myelogenous leukemia



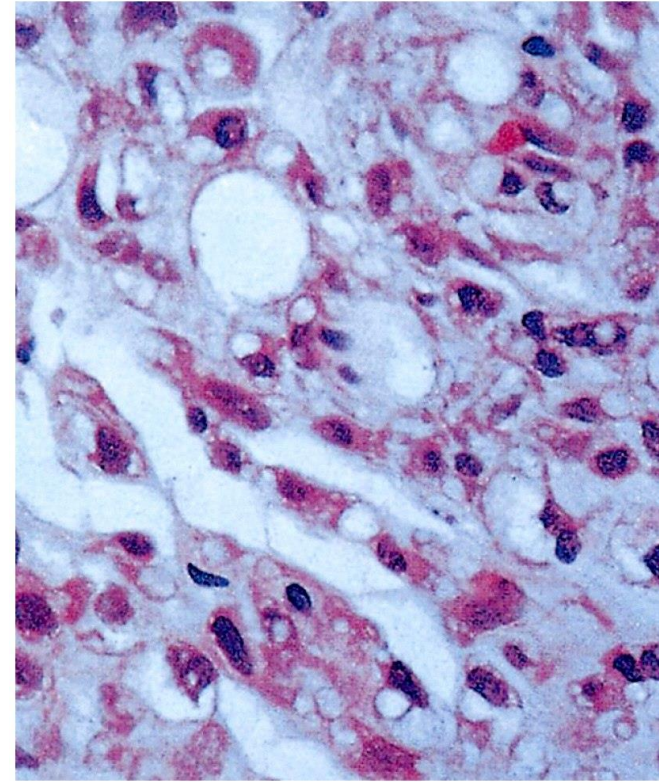
multiple myeloma

cancer  
theory

front  
minor



**osteosarcoma**



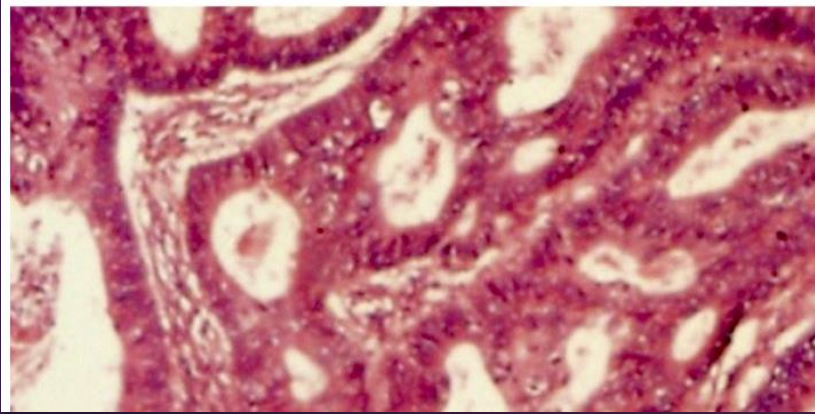
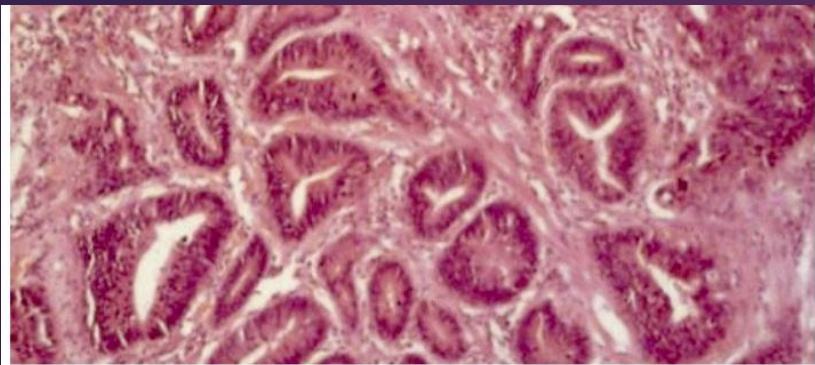
**liposarcoma**

cancer  
theory

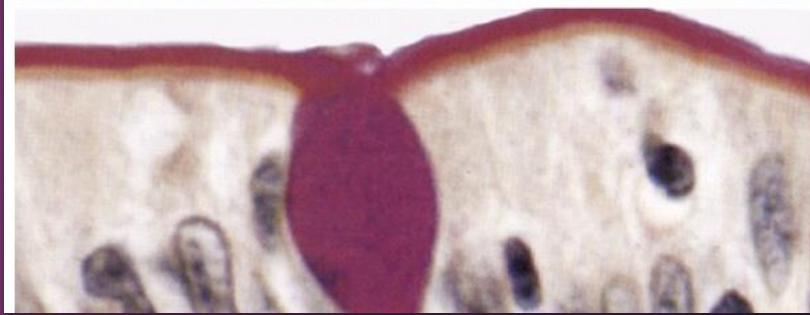
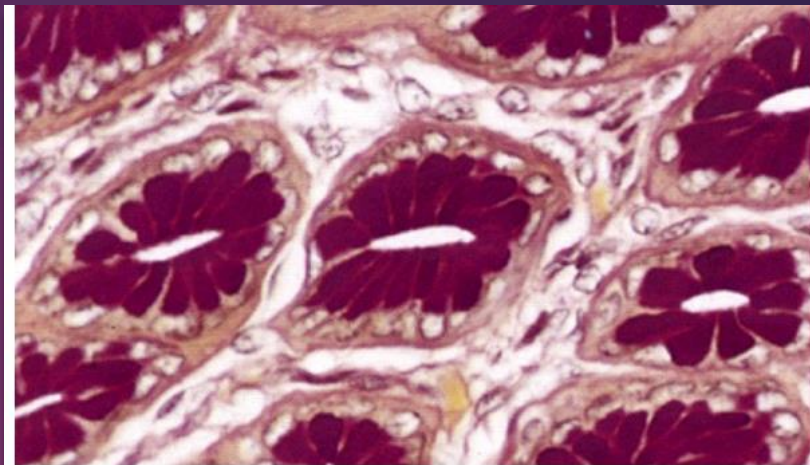
invest  
cancer

cancer  
theory

present  
control

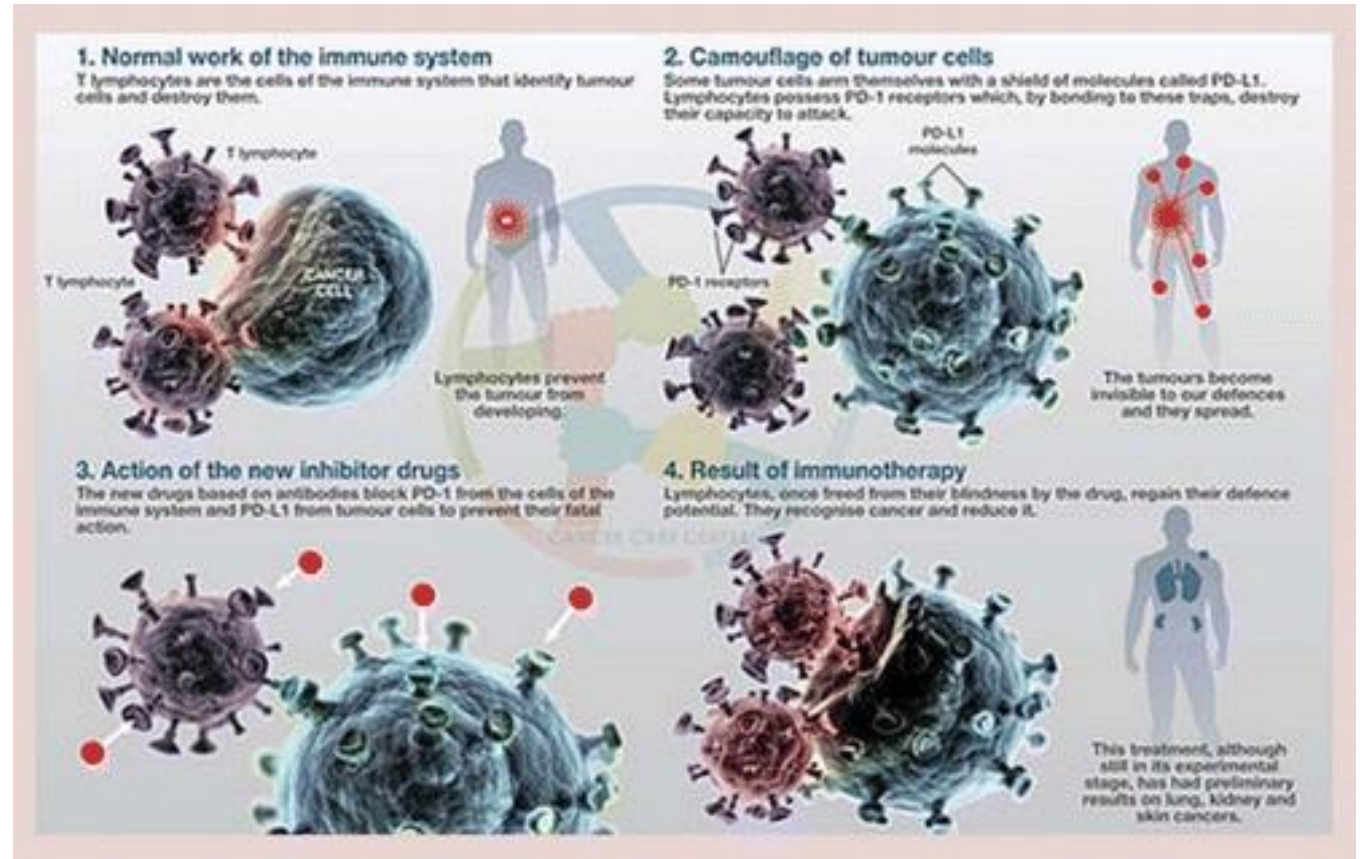


mucus-secreting cells  
of the stomach



adenocarcinoma  
of the stomach

► Immunotherapy the mechanism of action and the Survival benefit





<https://www.youtube.com/watch?v=UbFjiWOBErA>

