



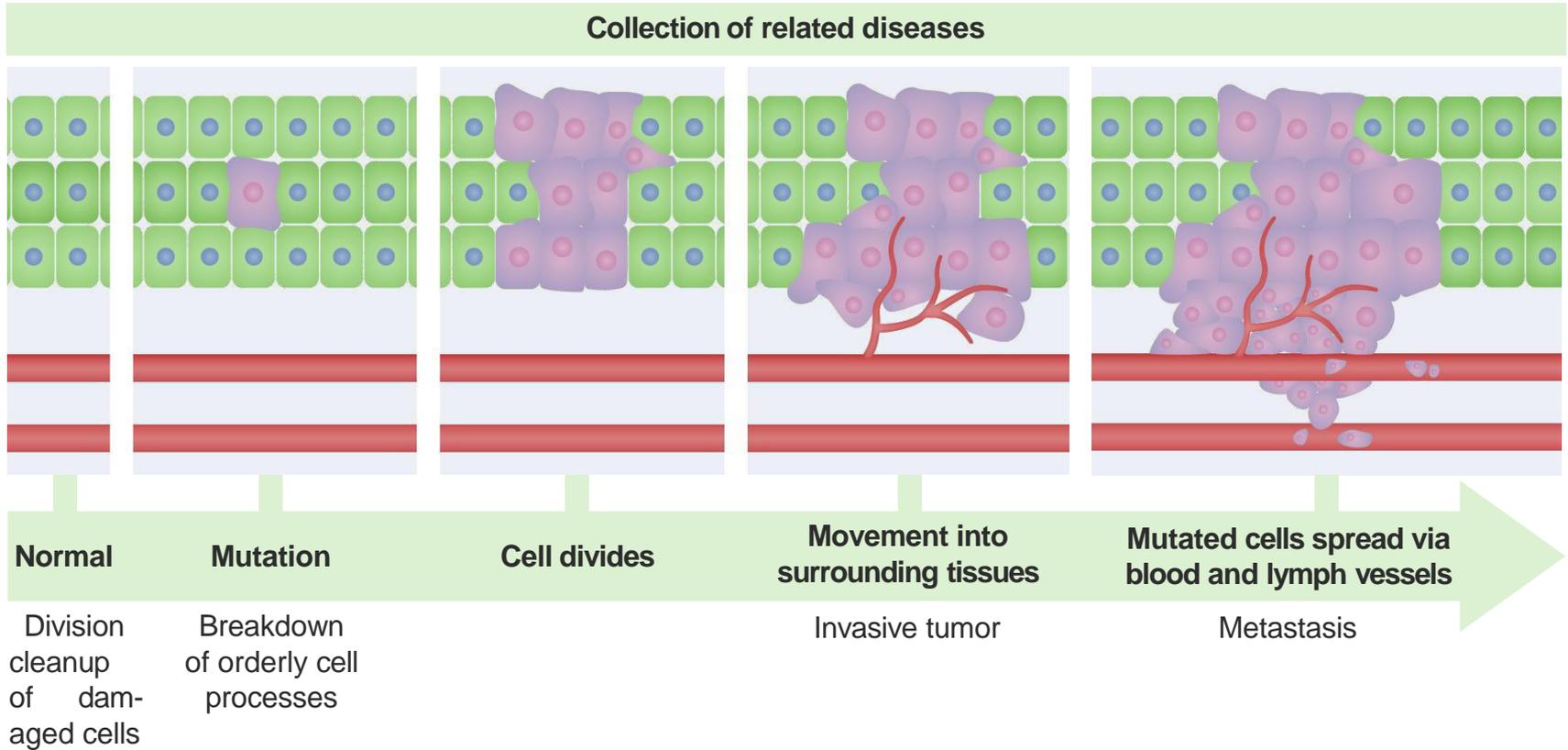
Overview of Cancer



10 Most Important Concepts

1. Definition of cancer
2. Cancer cells vs. non-cancer cells
3. Malignant tumors vs. benign tumors
4. Cancer cells as bullies
5. Evasion abilities of cancer cells
6. 3 ways cancer: genetic
7. 3 gene drivers of cancer
8. Metastasis cancer and its naming
9. Tissue changes of non-cancer and potential cancer
10. 8 commonly used names of cancer

What Is Cancer?

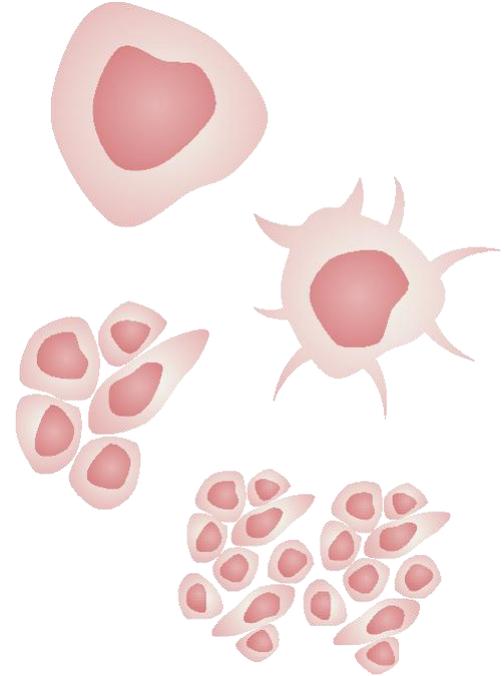


Cancer vs. Non-cancer Cells

Non-cancer	Cancer
Small, uniformly shaped nuclei with a relatively large cytoplasmic volume	 <p>Large, variable-shaped nuclei with a relatively small cytoplasmic volume</p>
May have differentiated cell structures; normal presentation of cell surface markers	 <p>Loss of normalized, specialized features; elevated expression of certain cell markers</p>
Conform in cell size and shape; cells arranged into discrete tissue	 <p>Variation in cell size and shape; disorganized arrangement</p>
Lower levels of dividing cells; cell's tissue clearly demarcated	 <p>Large number of dividing cells; poorly defined tumor boundaries</p>

What Makes Cancer Cells Different?

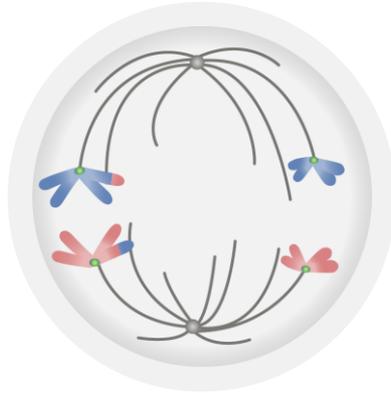
- Less specialized
- Less distinct cell types and functions
- Unrestricted division and programmed cell death
- Influence on other cells
- Development of tumor blood supply
- Immune system defenses
 - Evasion
 - Suppression



Cancer Is a Genetic Disease



Inheritance
from parents



Error in DNA
during cell division



Environmental
exposure

Changes in DNA can result from:



Drivers of Cancer

3 main types of genes (that are involved in normal cell growth, division, and programmed death) experience DNA changes:

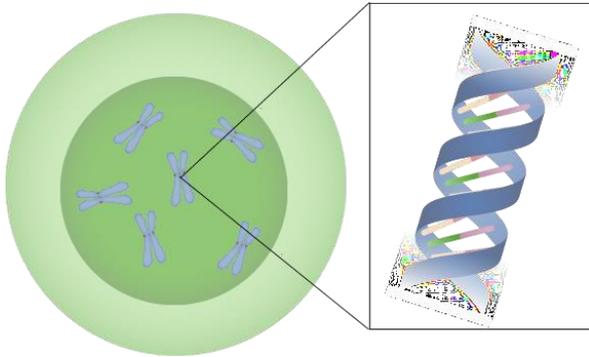
Proto-oncogenes
(become oncogenes)

Tumor suppressor
genes

DNA repair
genes

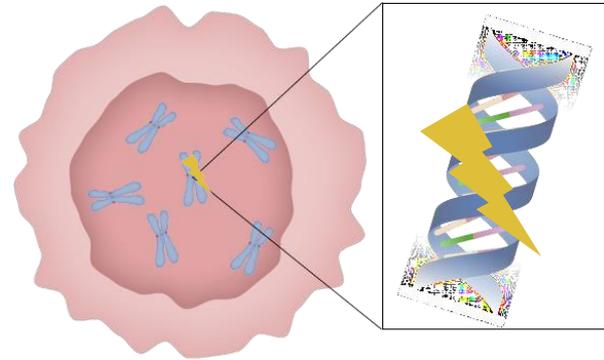
Drivers of Cancer

Proto-oncogenes:
genes that could lead to unregulated cell
growth/reproduction if damaged



Normal cell

Oncogenes:
damaged proto-oncogenes



Cancer cell

Drivers of Cancer

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Usually: normal cell growth, division, and programmed death

Drivers of Cancer

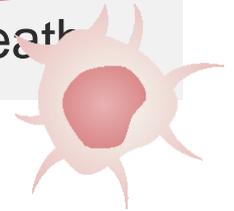
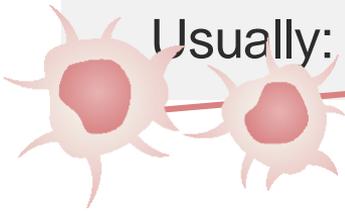
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Metastasis Process

1. Benign tumor in epithelium

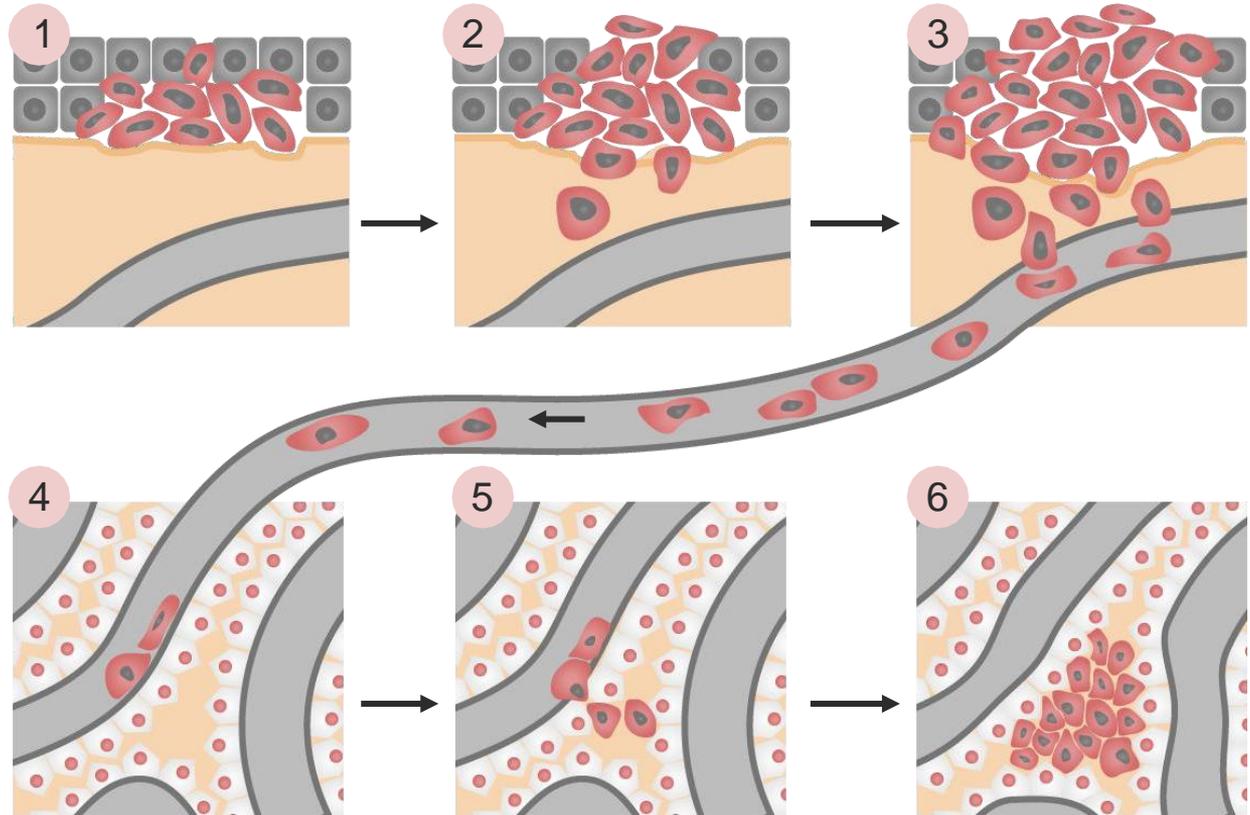
2. Tumor breaks through basal lamina

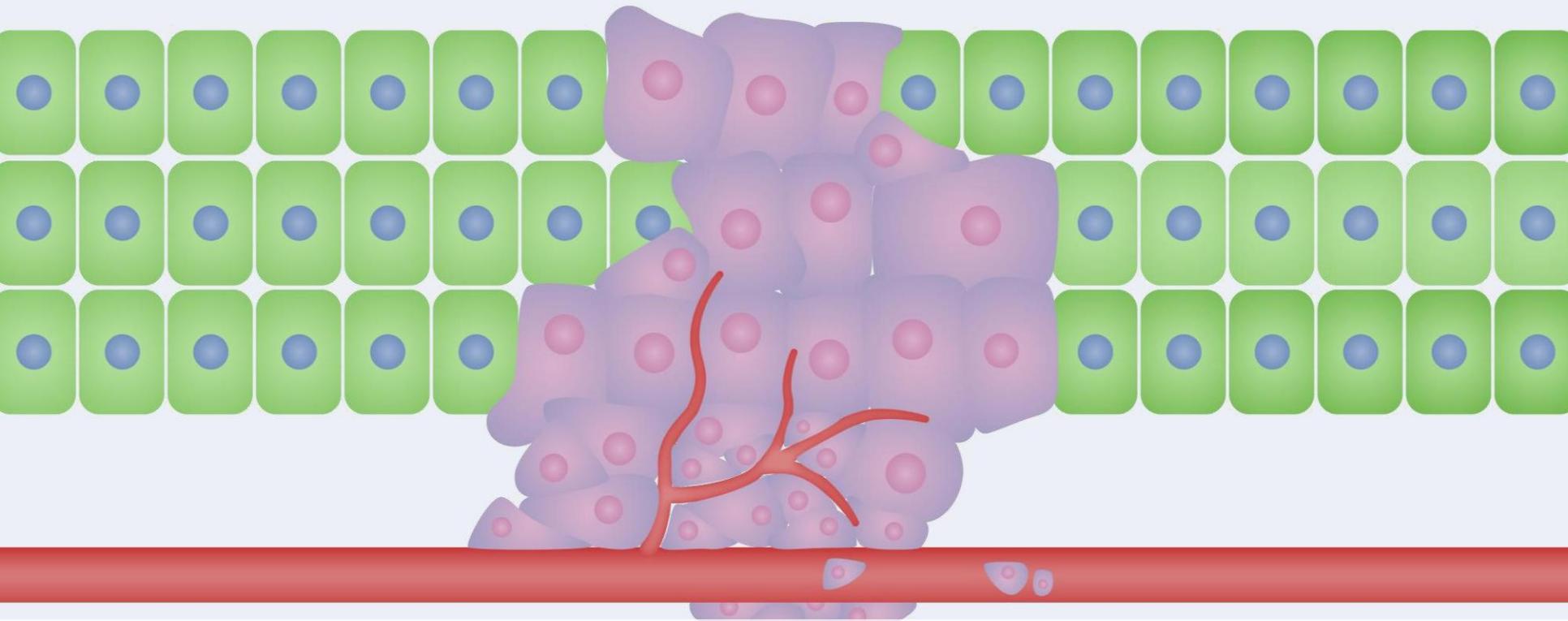
3. Invades capillary

4. Adheres to blood vessel wall in the liver

5. Extravasation occurs

6. Proliferates to form metastases





What is metastasis?

What Is Metastasis?

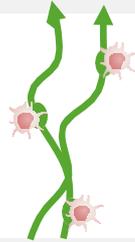
The metastatic tumor is the same type of cancer as the primary tumor.



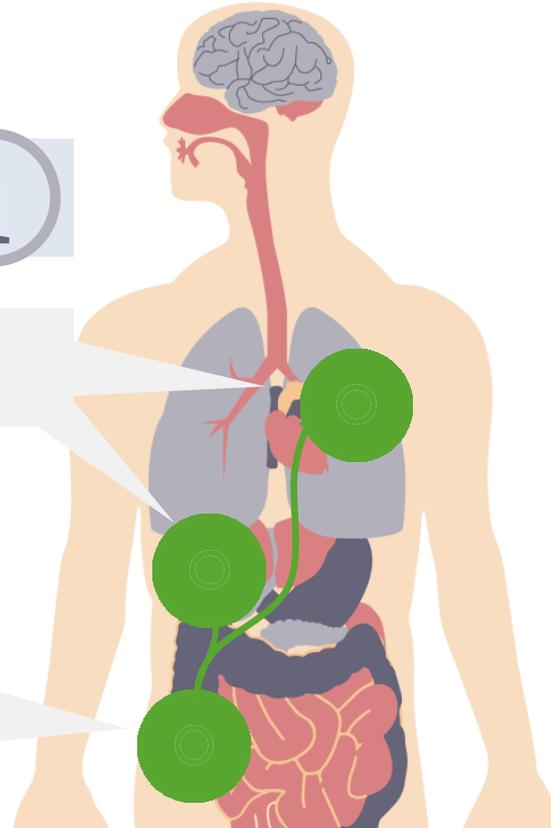
It forms new tumors (metastatic tumors) in other parts of the body.



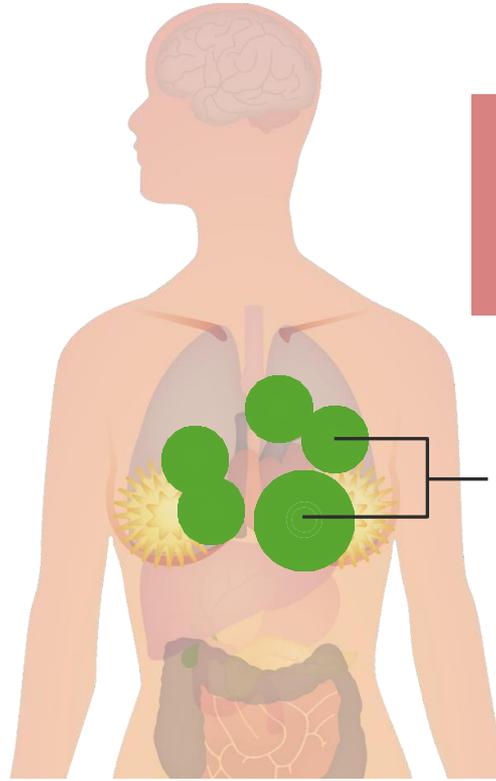
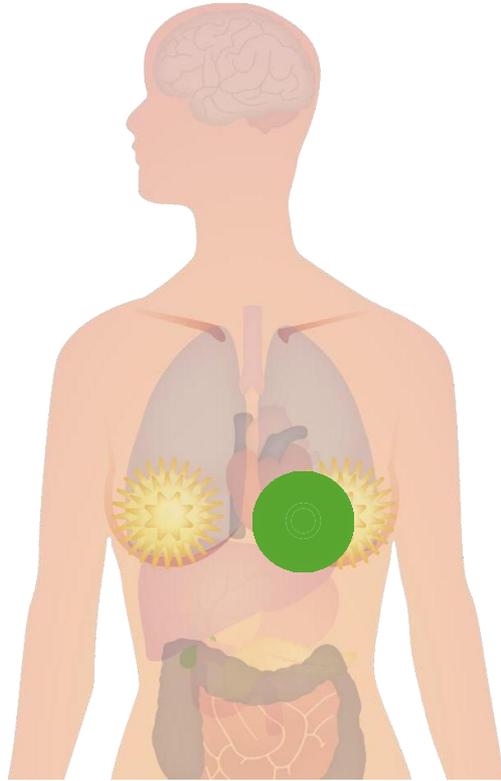
It travels through the **blood or lymph system.**



Cancer cells break away from where they first formed (primary cancer).



Naming Metastases



Naming: Primary breast cancer that spreads to the lungs is metastatic breast cancer, **not** lung cancer!

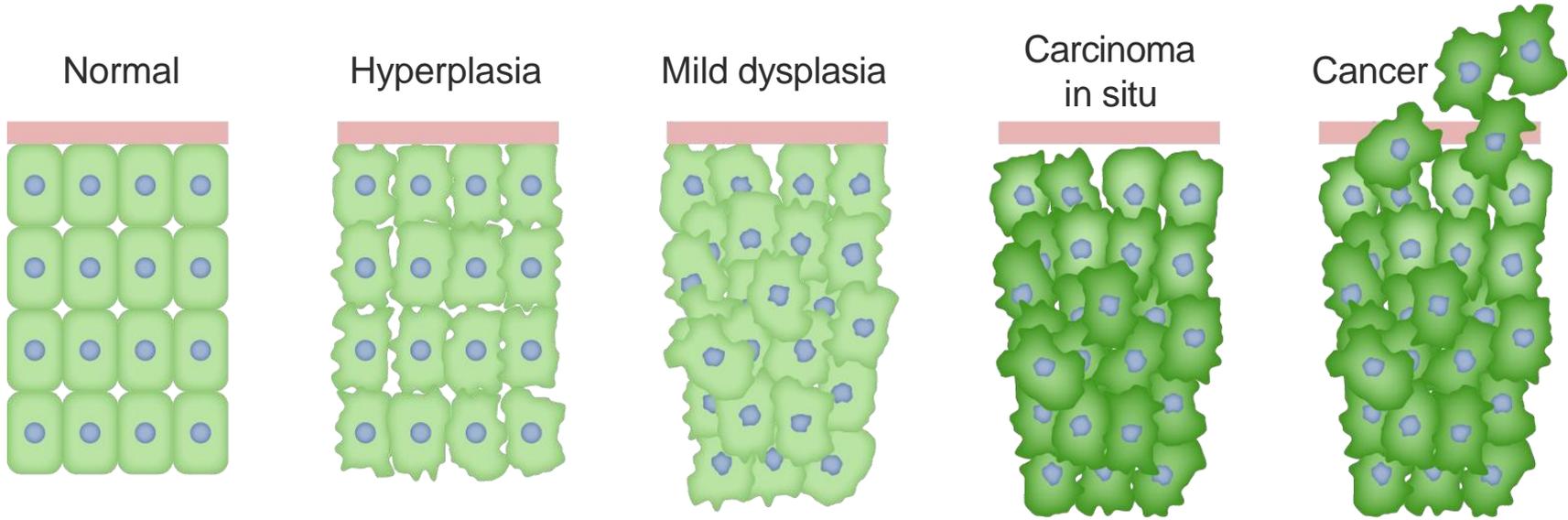
The microscopic view of metastatic cells is similar to that of primary cancer cells.

Primary Goal of Treatment



The primary goal of treatment is to slow the growth of the cancer and treat symptoms caused by the metastases.

Tissue Changes



Not every tissue change is cancer!

Hyperplasia

Dysplasia

Carcinoma in situ



Categories of Cancer

Begin in certain types of cells:

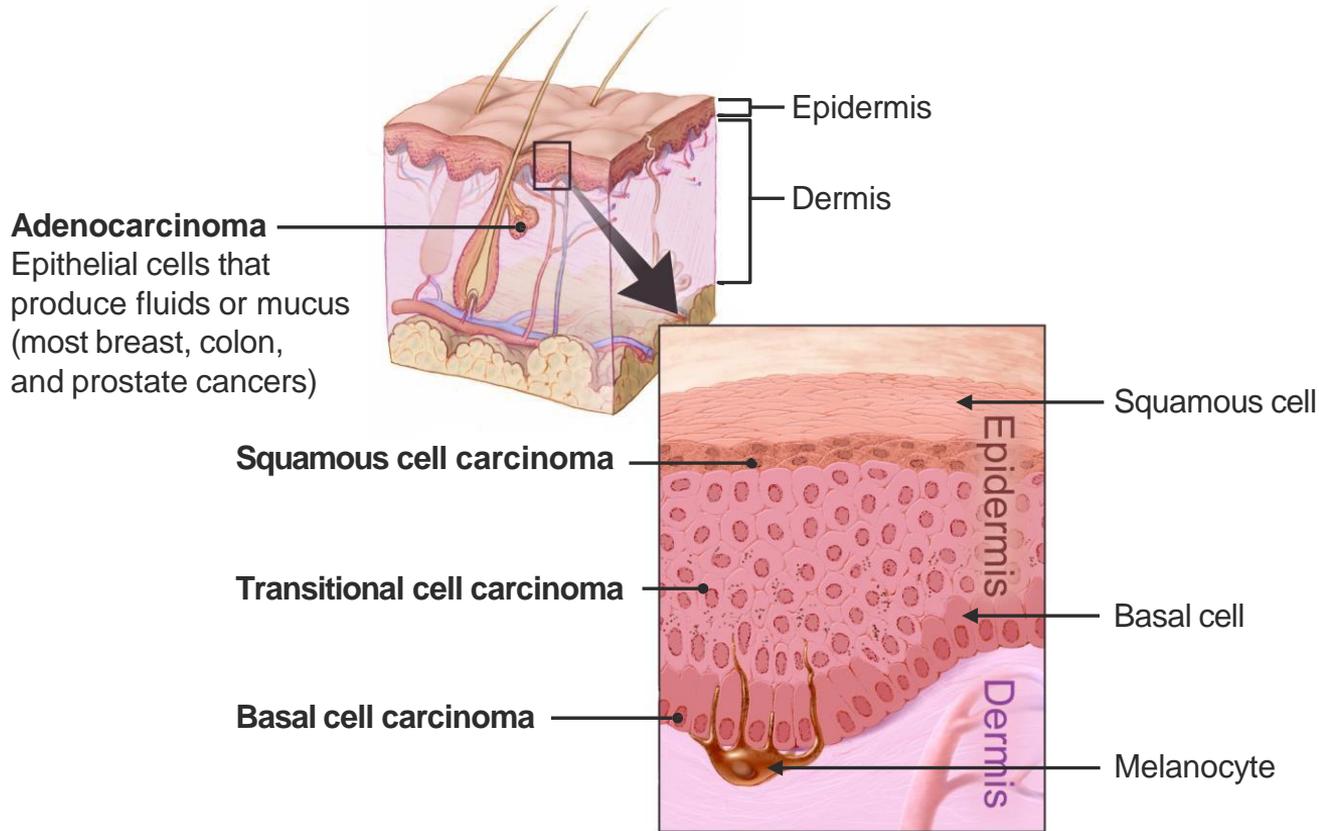
- Carcinoma
- Sarcoma
- Leukemia
- Lymphoma
- Multiple myeloma
- Melanoma
- Brain and spinal cord

Carcinoma



Carcinoma is the most common form of cancer. It is formed by epithelial cells.

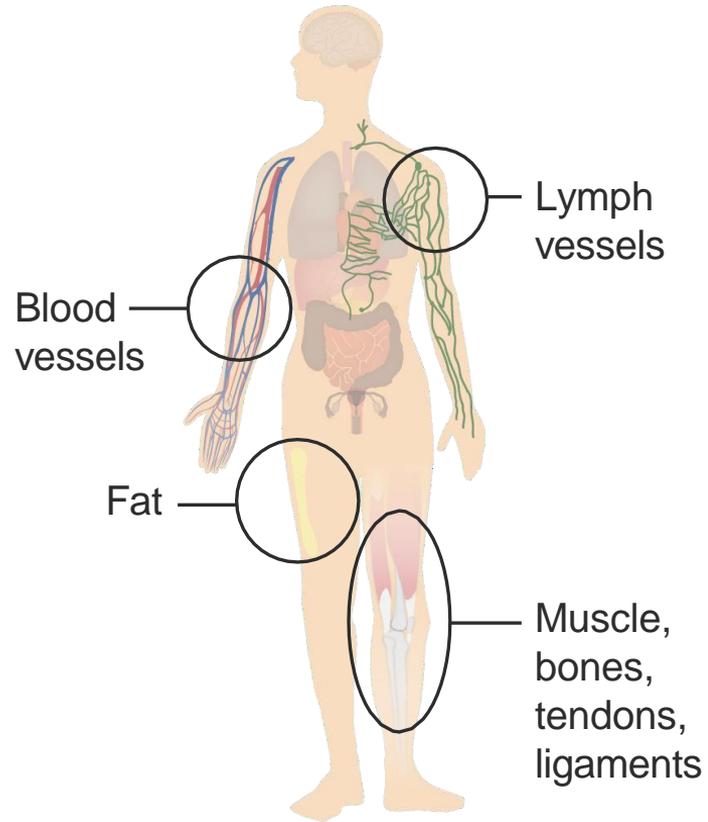
Carcinoma – 4 Different Epithelial Cell Types



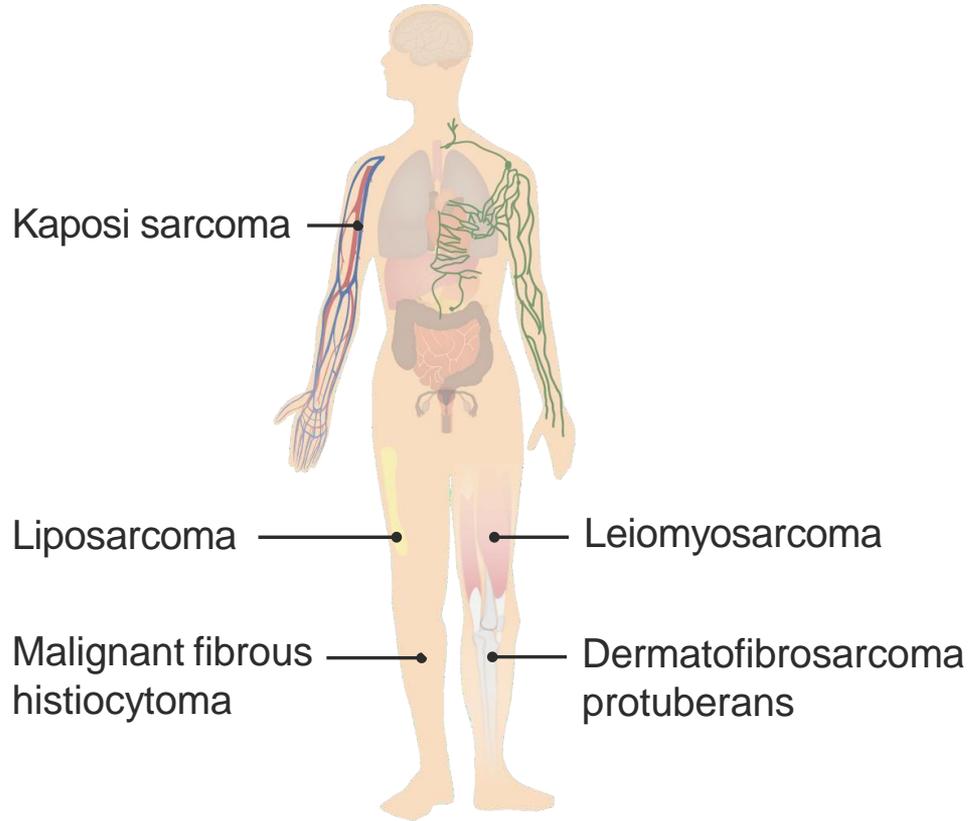
Sarcoma

Formed in:
soft tissue and bone

Most common cancer of bone:
osteosarcoma

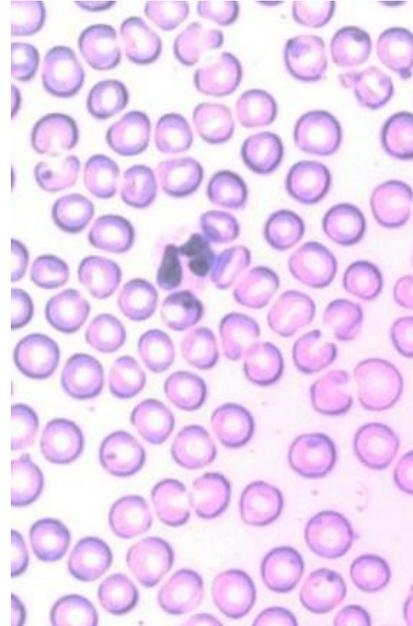


Most Common Types of Soft Tissue Sarcoma

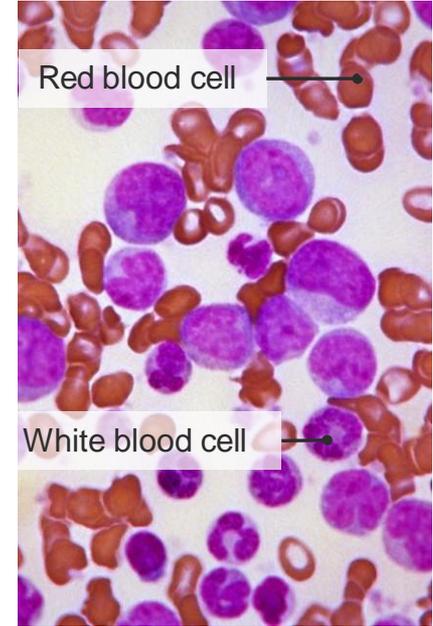


Leukemia

- Begins in the blood-forming tissue of the bone marrow
- Does not form solid tumors
- Large numbers of abnormal white blood cells (leukemia cells and leukemic blast cells) build up in the blood and bone marrow
- Inadequate normal cells cause poor oxygenation, bleeding risk, and inability to fight off infection



Normal



Leukemia

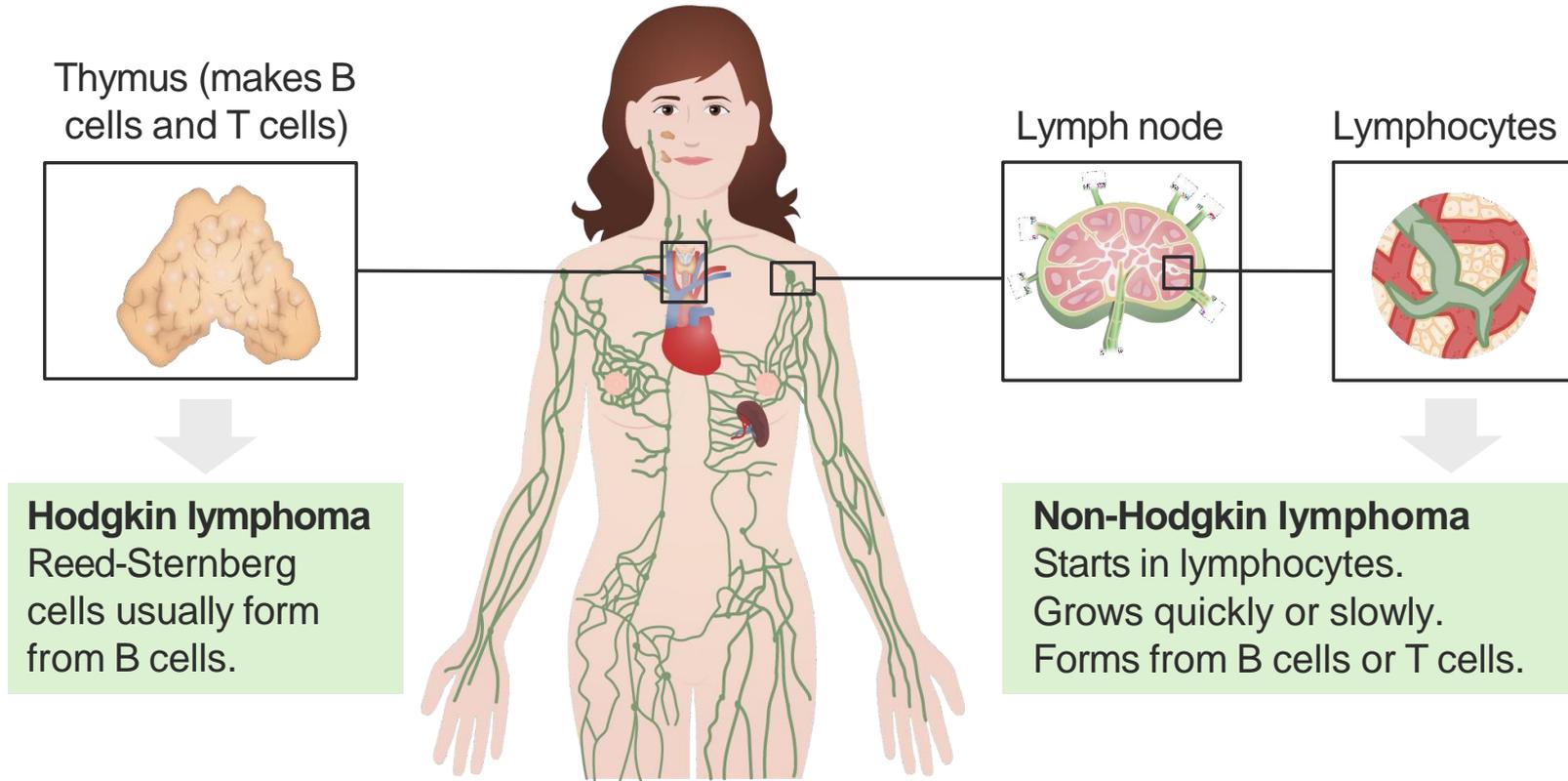
Lymphoma



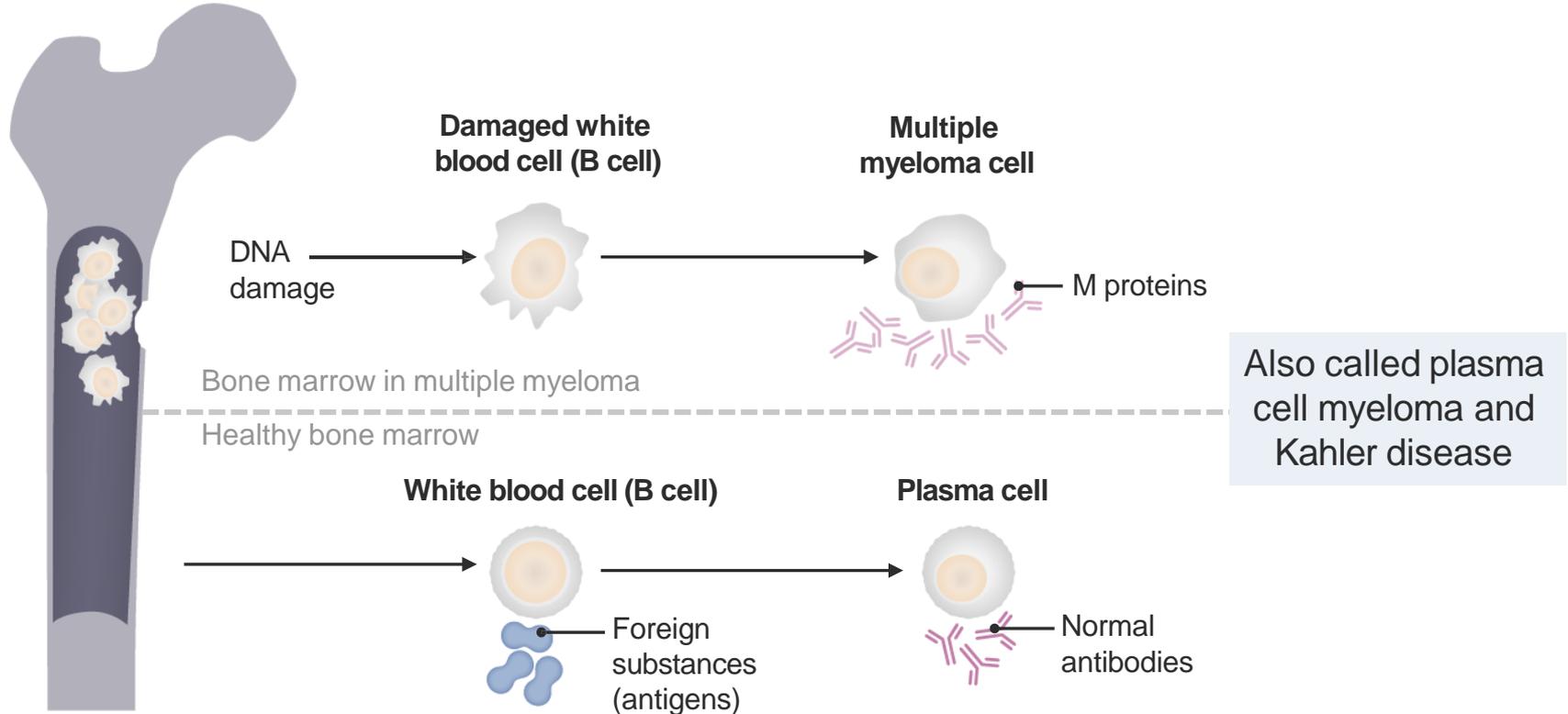
Lymphoma begins in lymphocytes (T cells or B cells).

Abnormal lymphocytes build up in the lymph nodes, lymph vessels, and organs.

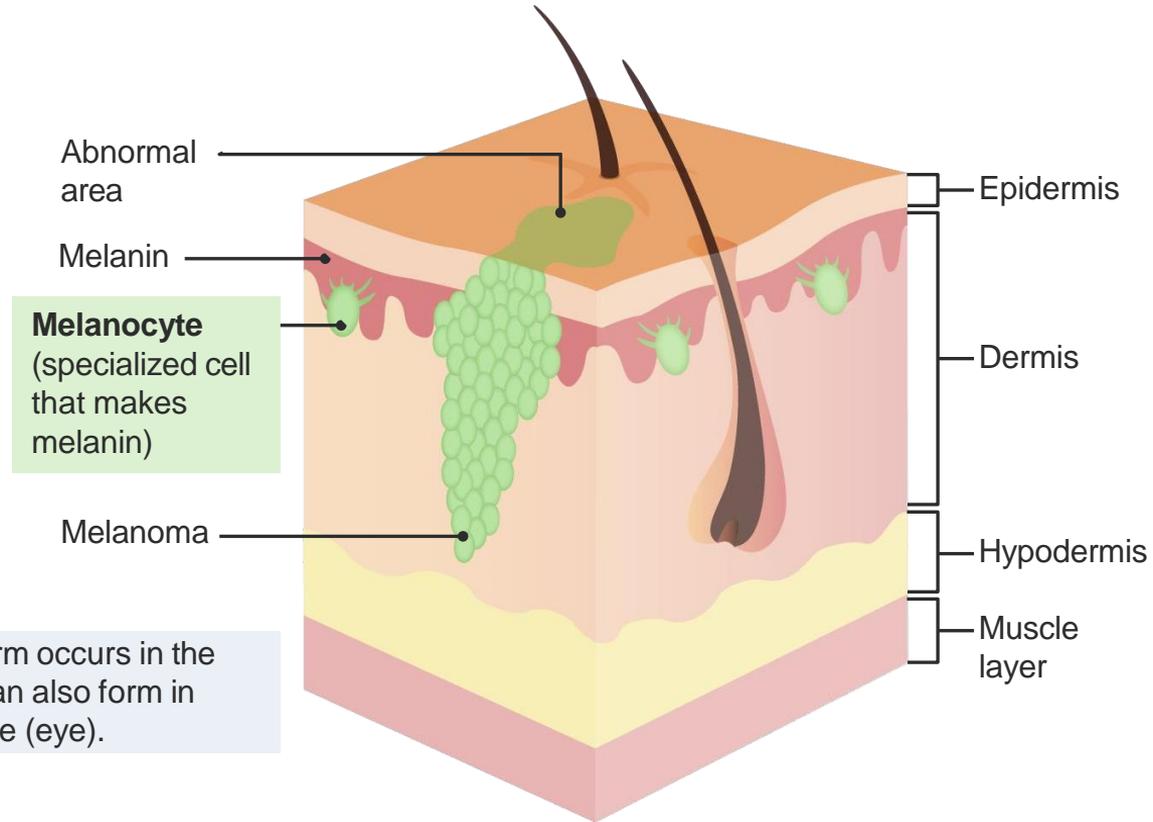
Lymphoma



Multiple Myeloma



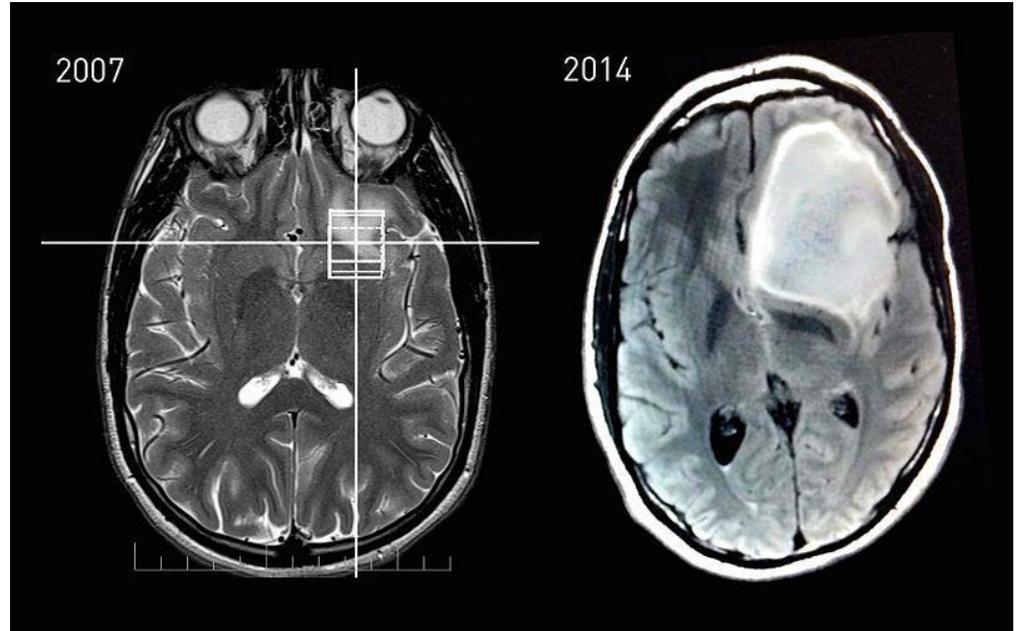
Melanoma



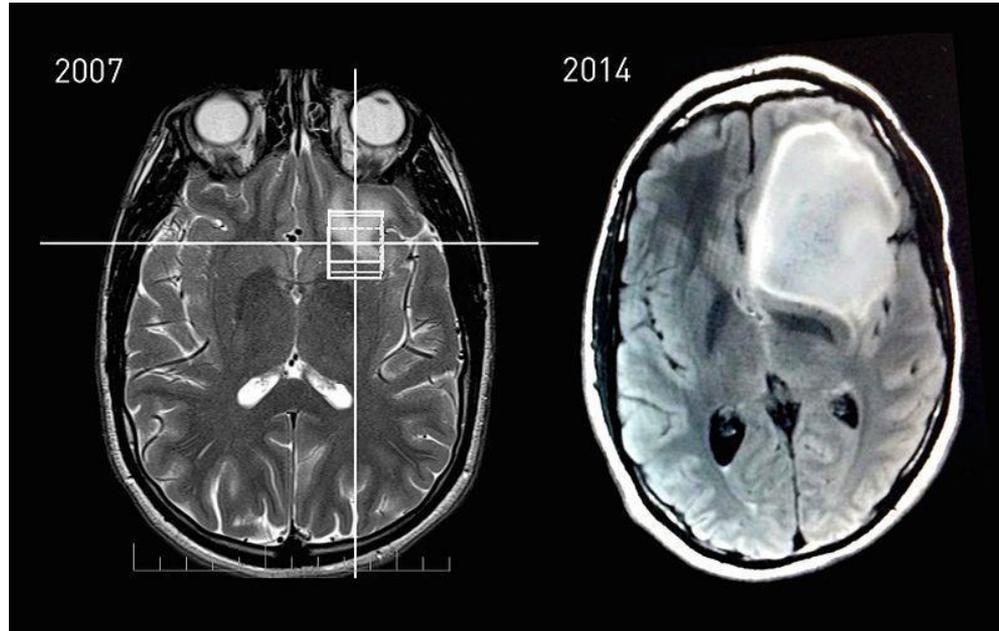
The most common form occurs in the skin, but melanoma can also form in other pigmented tissue (eye).

Brain and Spinal Cord Tumors

- Many different types of brain and spinal cord tumors
- Named based on the type of cell in which they are formed



Brain and Spinal Cord Tumors

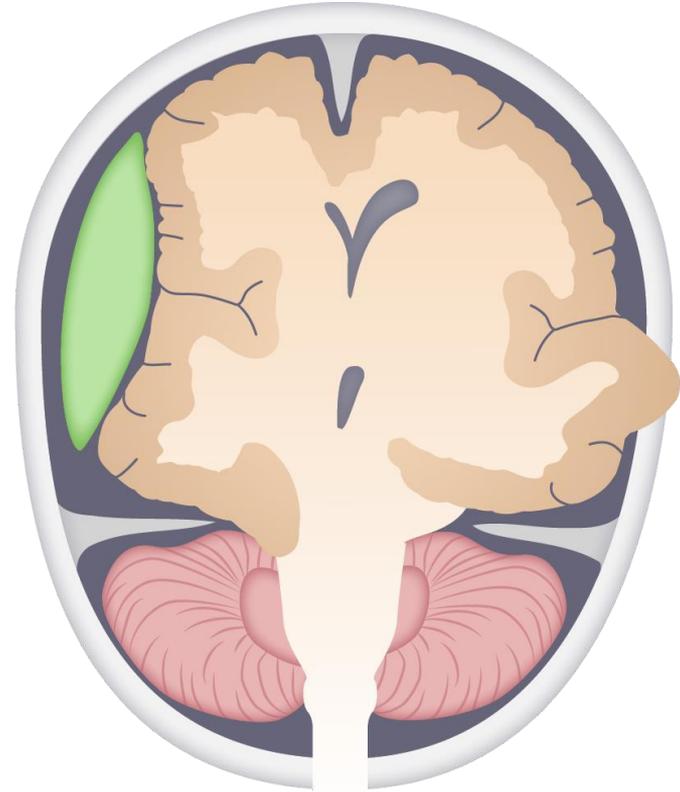


Example:

An astrocytic tumor starts in the astrocytes (star-shaped brain cells).

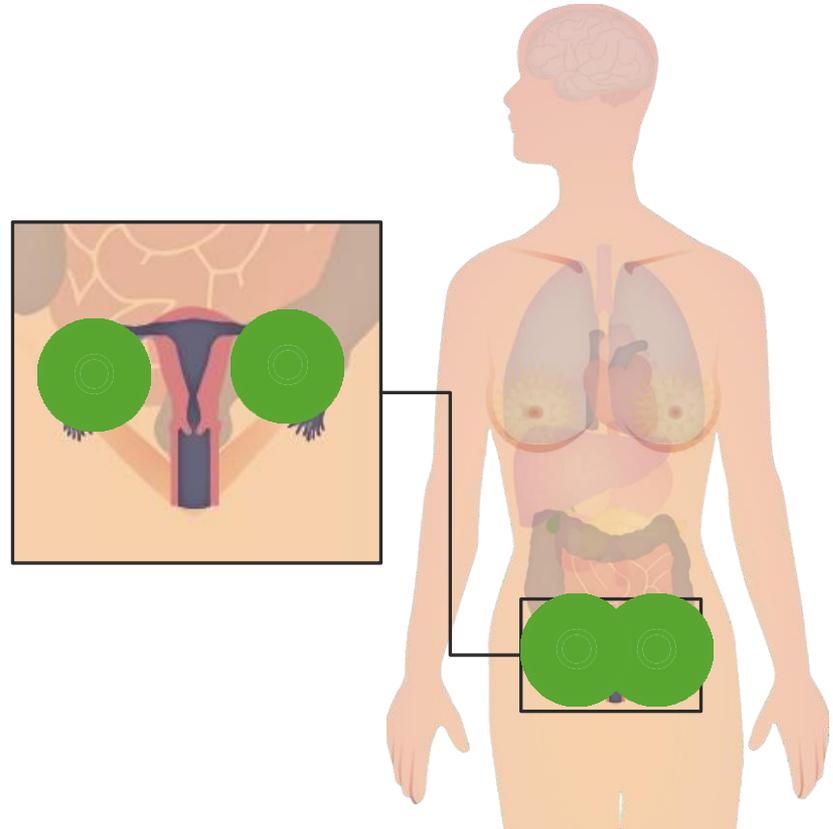
Brain and Spinal Cord Tumors

- Brain tumors can be benign or malignant
- Even benign brain tumors are dangerous



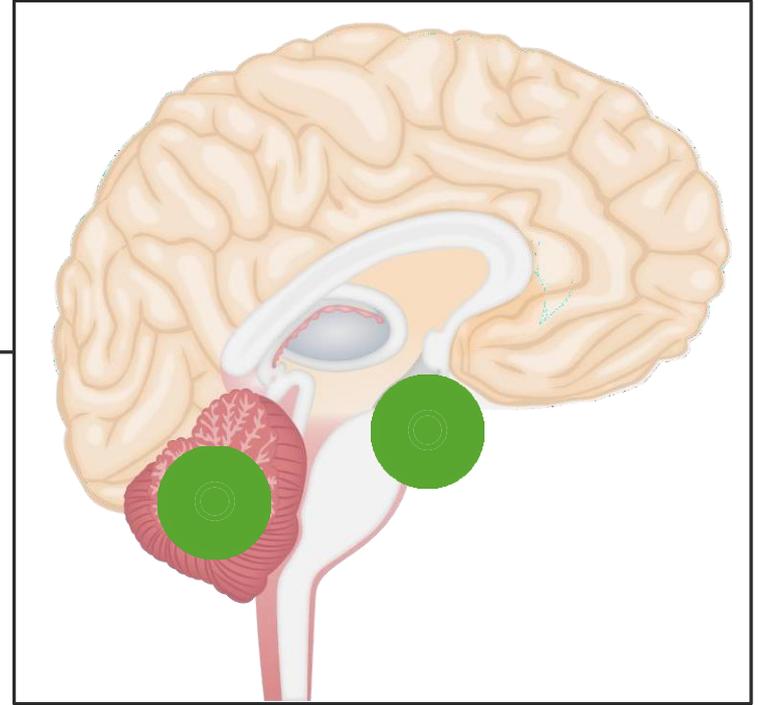
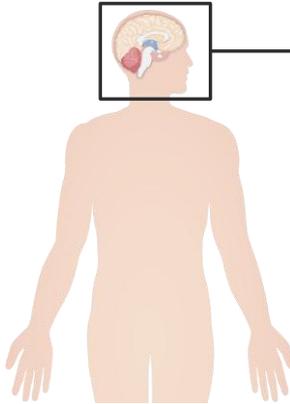
Germ Cell Tumors

- Begin in the cells that become sperm or eggs
- Can occur almost anywhere in the body and can be benign or malignant



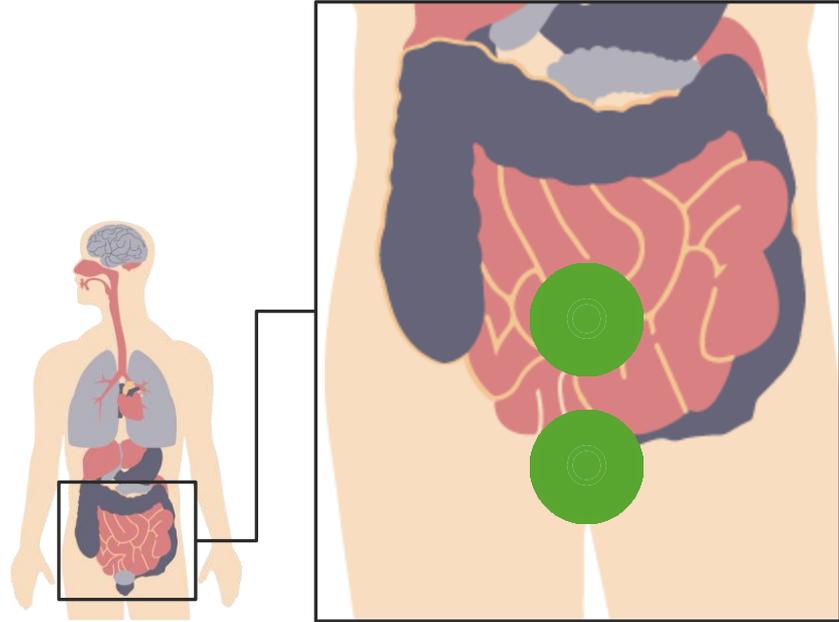
Neuroendocrine Tumors

- Form from cells that release hormones into the blood
- Higher levels of hormones due to tumors
- May be benign or malignant



Carcinoid Tumors

- Are a type of neuroendocrine tumor
- Slow-growing tumors usually found in the GI system (often rectum and the small intestine)
- May spread to the liver or other sites
- May secrete serotonin or prostaglandins, causing carcinoid syndrome



In a Nutshell

- ✓ Cancer is a collection of related diseases where there is a breakdown of orderly cell processes.
- ✓ In metastasis, cancer cells break away from where they first formed (the primary cancer), travel through the blood or lymph system, and form new tumors (metastatic tumors) in other parts of the body.
- ✓ Cancer can be categorized based on the type of cell where it begins: carcinoma, sarcoma, leukemia, lymphoma, multiple myeloma, melanoma, on the brain and spinal cord.

