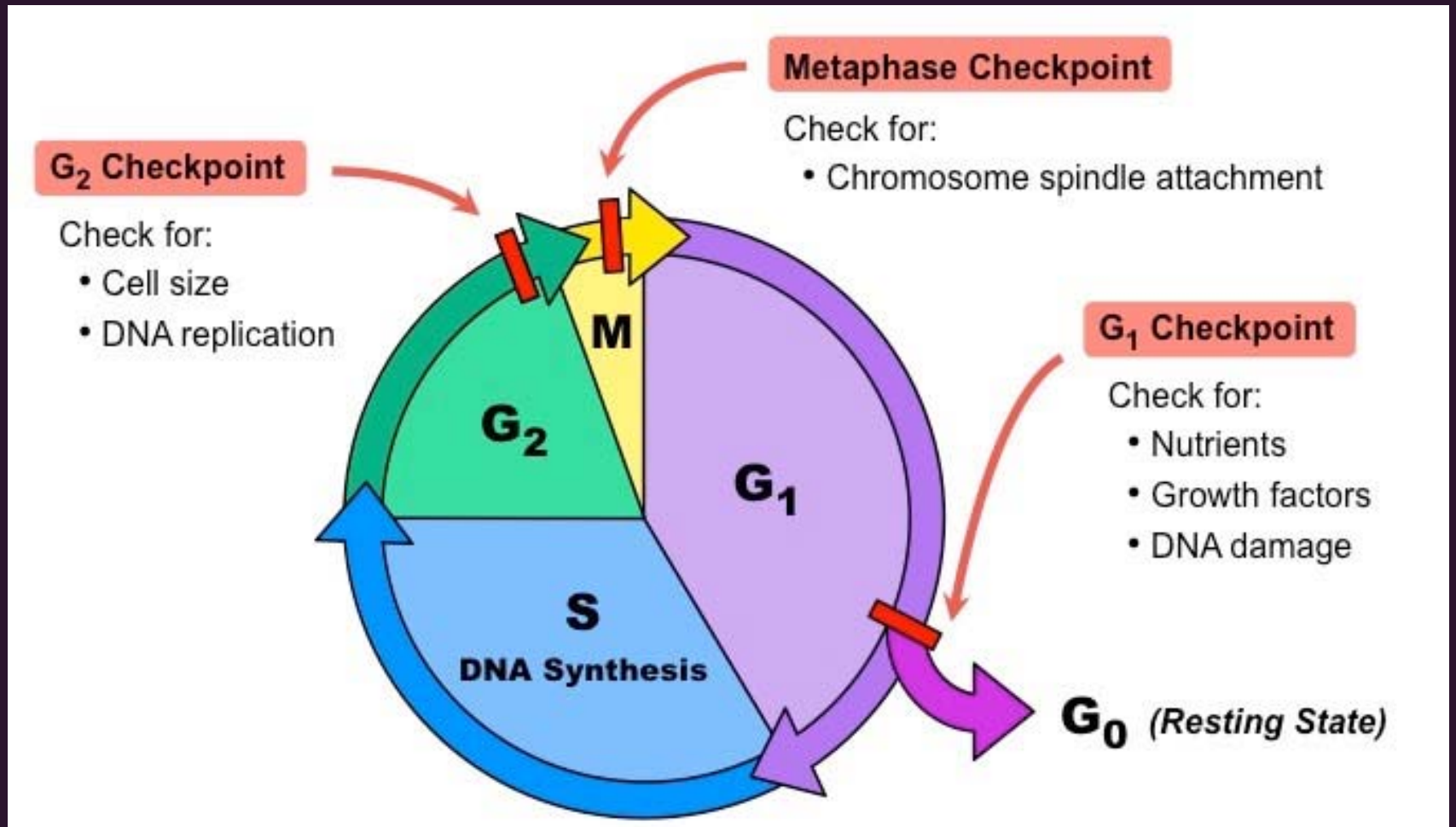
CANCER NOTES

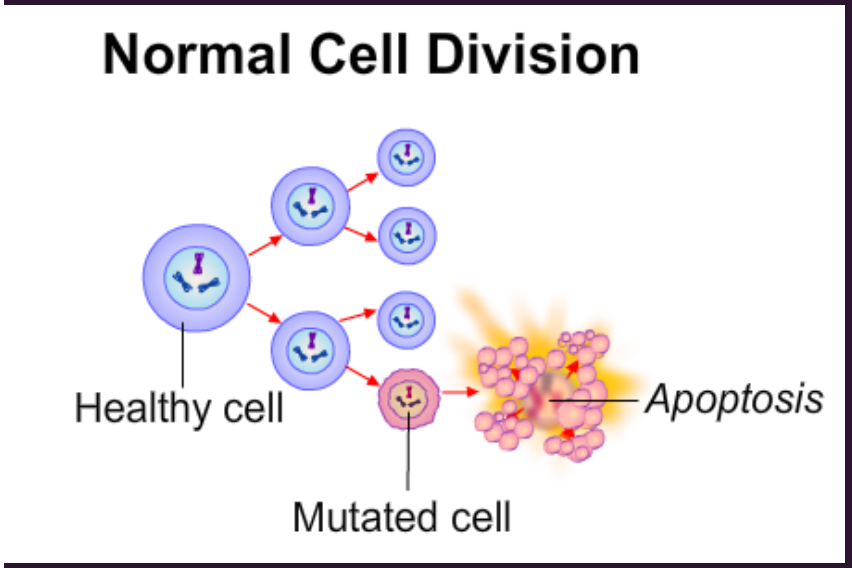
- **Student Expectation (SE) 5D – recognize** that disruptions in the cell cycle *lead to diseases such as cancer*

1. Cell Cycle Control

- The Cell cycle is regulated by a series of checkpoints and signals from other cells



Failing a checkpoint



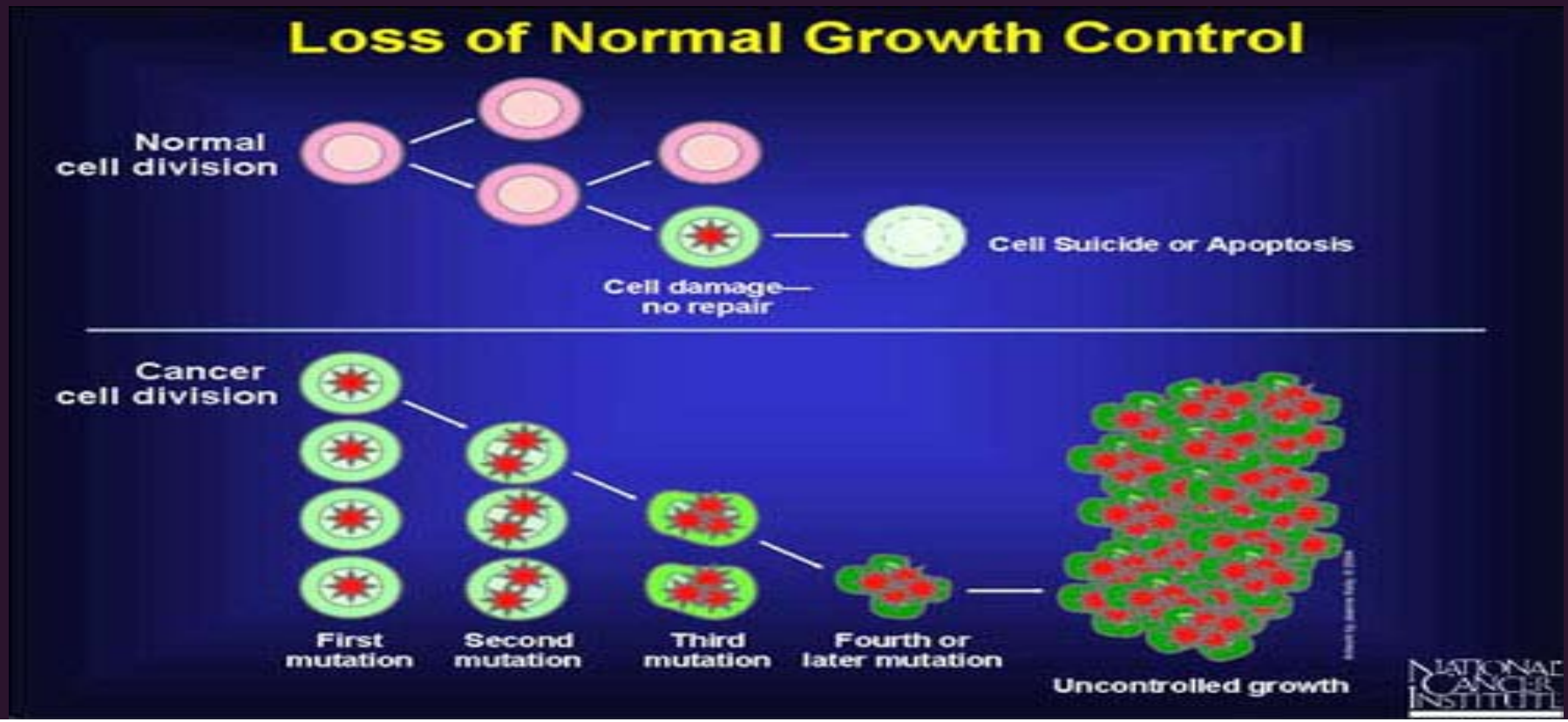
- If a cell cannot pass a checkpoint it will:
  - Stop and repair (Fix damaged DNA)
  - Start Apoptosis- programmed cell death
- Cells will also enter the G_0 phase if given a signal to stop dividing (Such as touching the cell next to them)

Stop and Think!

- What kinds of signals would cause a cell to stop dividing? How would a cell fail a checkpoint?
- What happens if a cell ignores these signals?
- Discuss with your table for 1 min- be ready to share

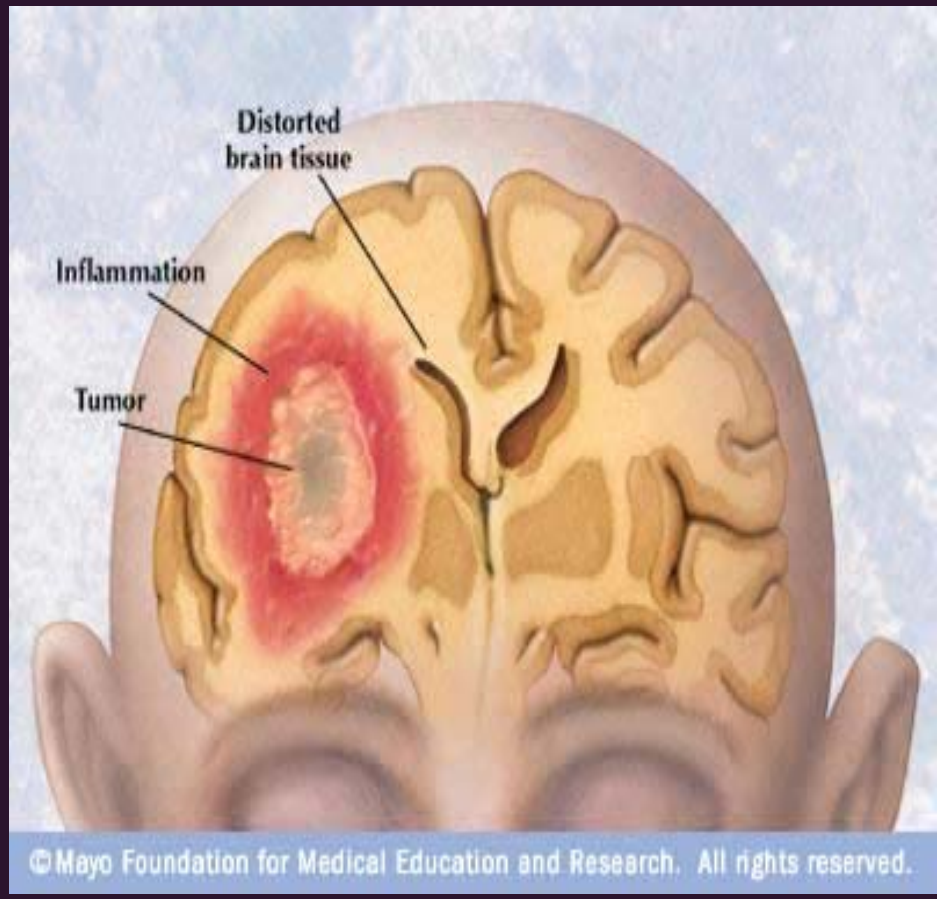
2. What happens if a cell cannot enter G_0 or die?

- Cells who cannot enter G_0, or start apoptosis will start dividing uncontrollably, creating a tumor

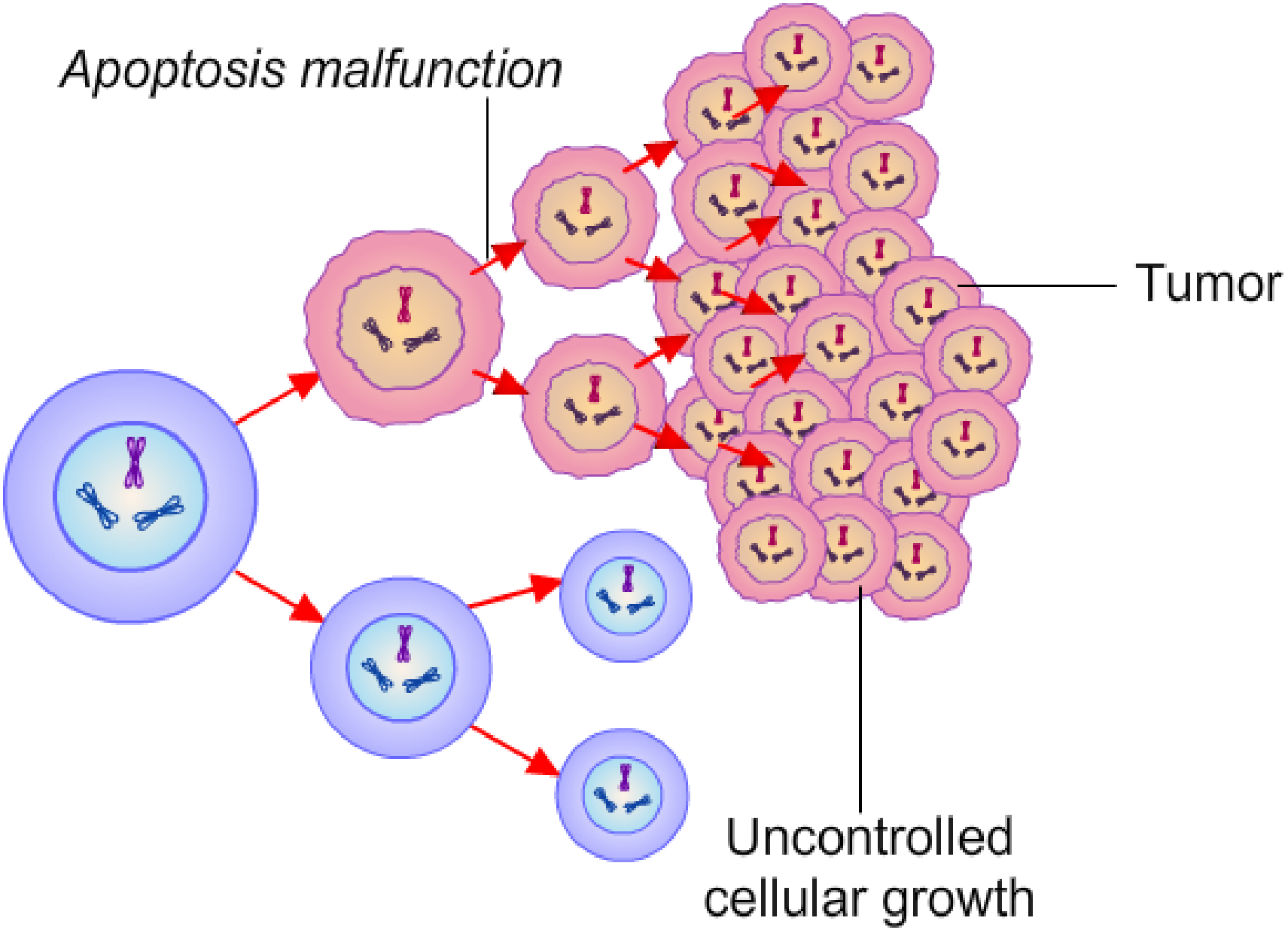


4. What is cancer?

- **Cancer** is a disease where uncontrolled cell growth causes a disruption in the cell cycle....No G_0
- Cancer cells do not respond to signals that control the cell cycle
- Mutations are passed to daughter cells

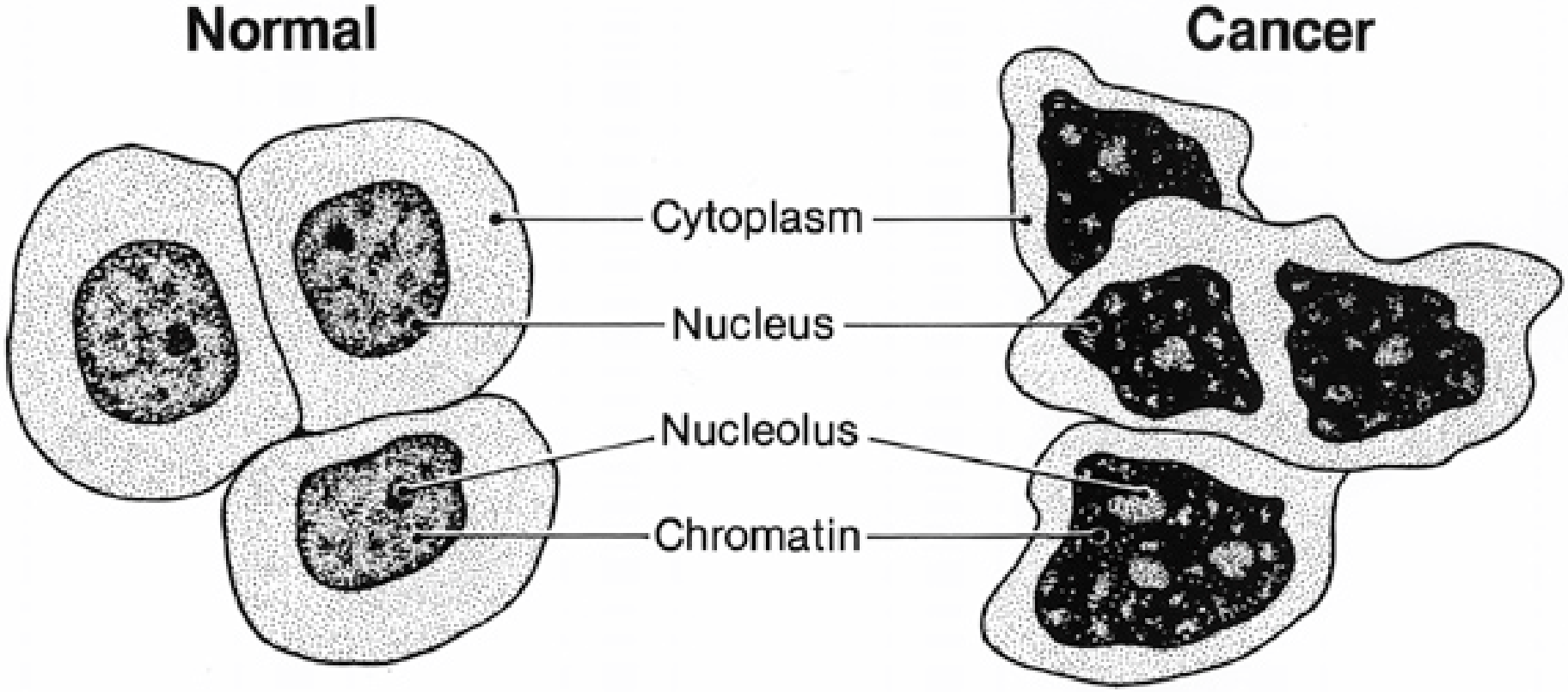


Cancer cells ignore chemical signals



Normal and Cancer Cells

Structure



— Large cytoplasm
— Single nucleus
— Single nucleolus
— Fine chromatin

— Small cytoplasm
— Multiple nuclei
— Multiple and large nucleoli
— Coarse chromatin

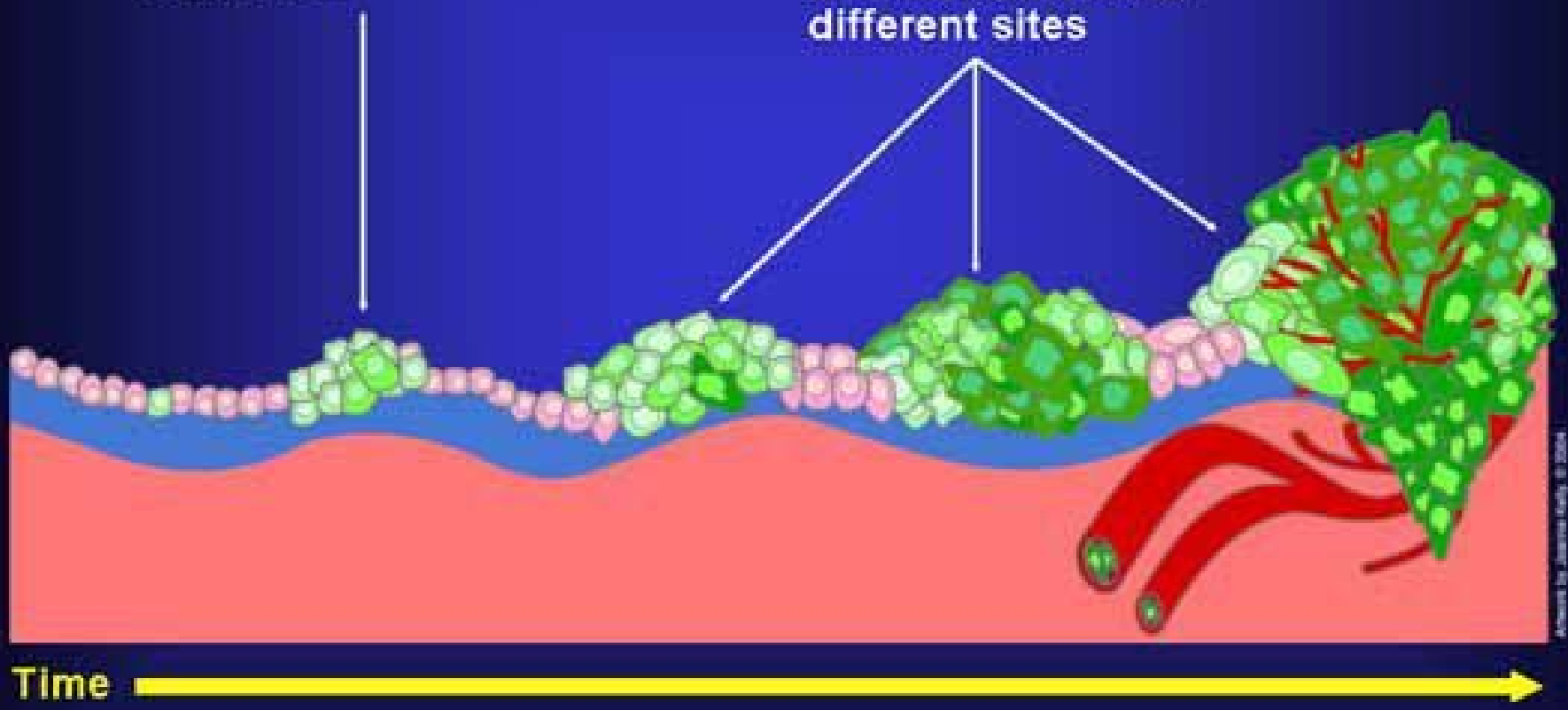
Types of Tumors

- Benign Tumors
  - Usually small and slow growing
  - Only found in original tissue
  - Do not spread, non-invasive
  - Minimal damage (depending on location)
- Malignant Tumors
  - Fast growing, large
  - Found in multiple tissues
  - Invasive, spreads to other areas (metastasize)
  - Cancer

3. Malignant versus Benign Tumors

A. Benign (not cancer) tumor cells grow only locally and cannot spread by invasion or metastasis

B. Malignant (cancer) cells invade neighboring tissues, enter blood vessels, and metastasize to different sites



Cancer Video

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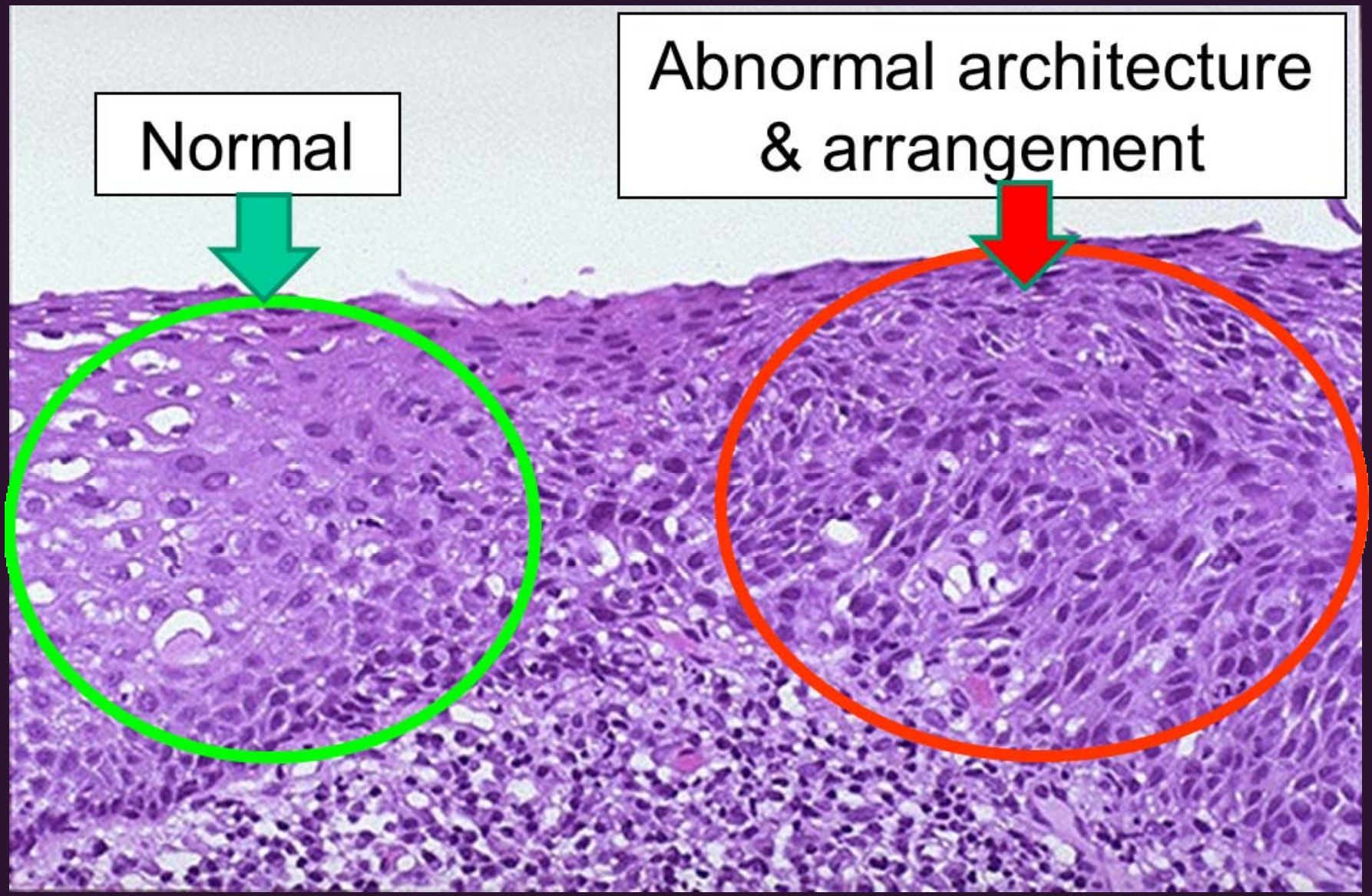
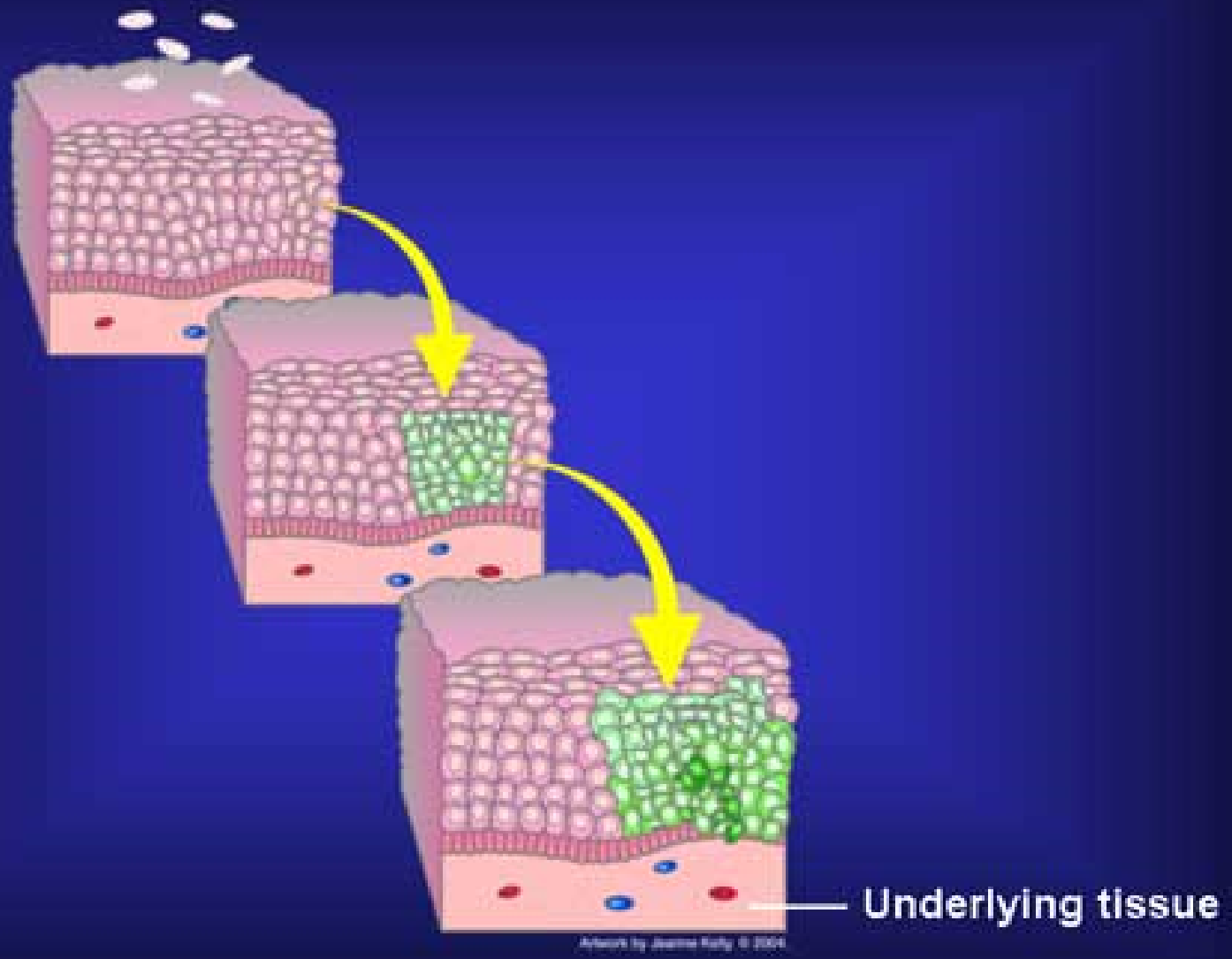
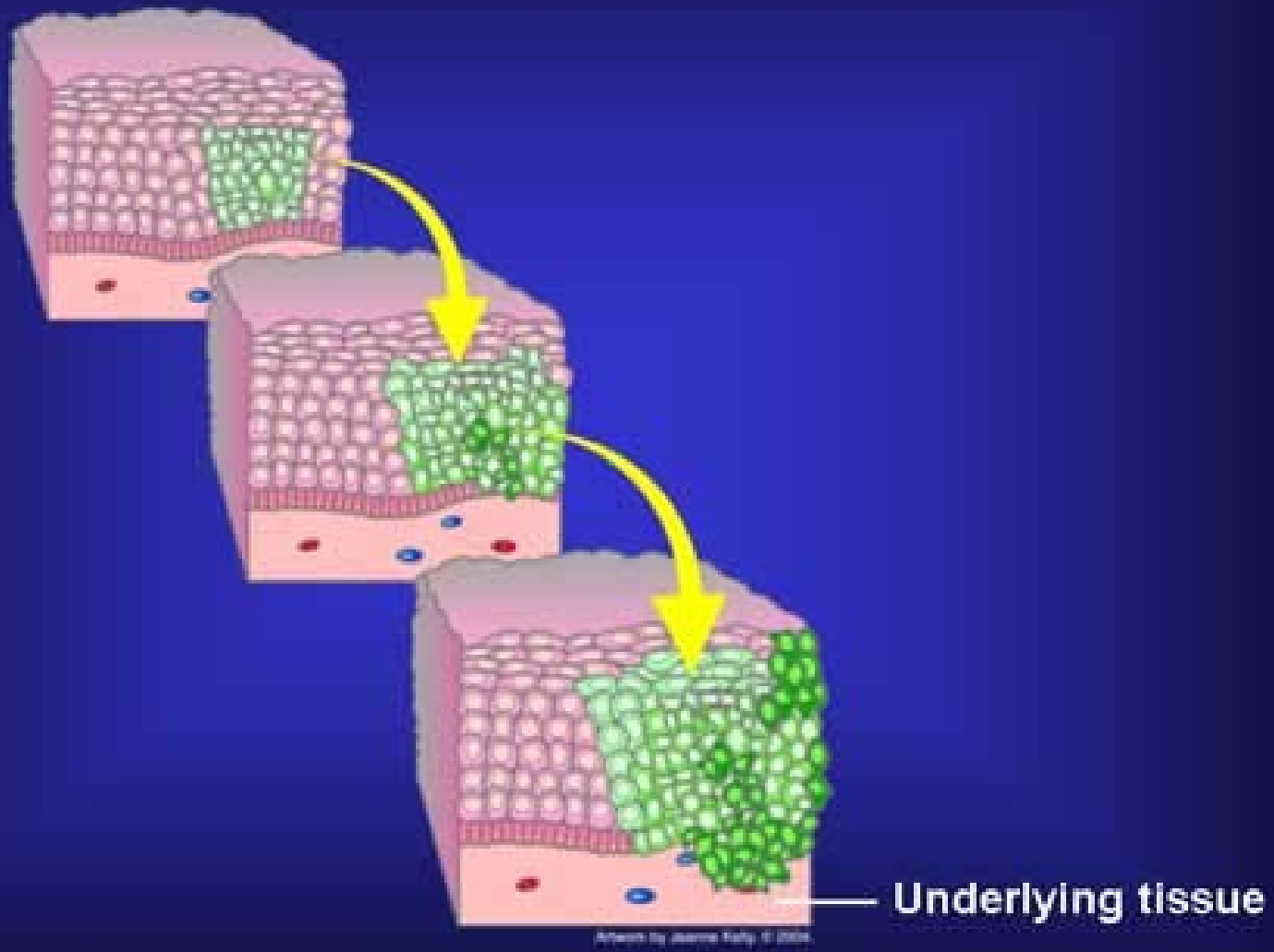

Normal
Abnormal architecture
& arrangement

Can you diagnose?

The Beginning of Cancerous Growth



Tumors (Neoplasms)



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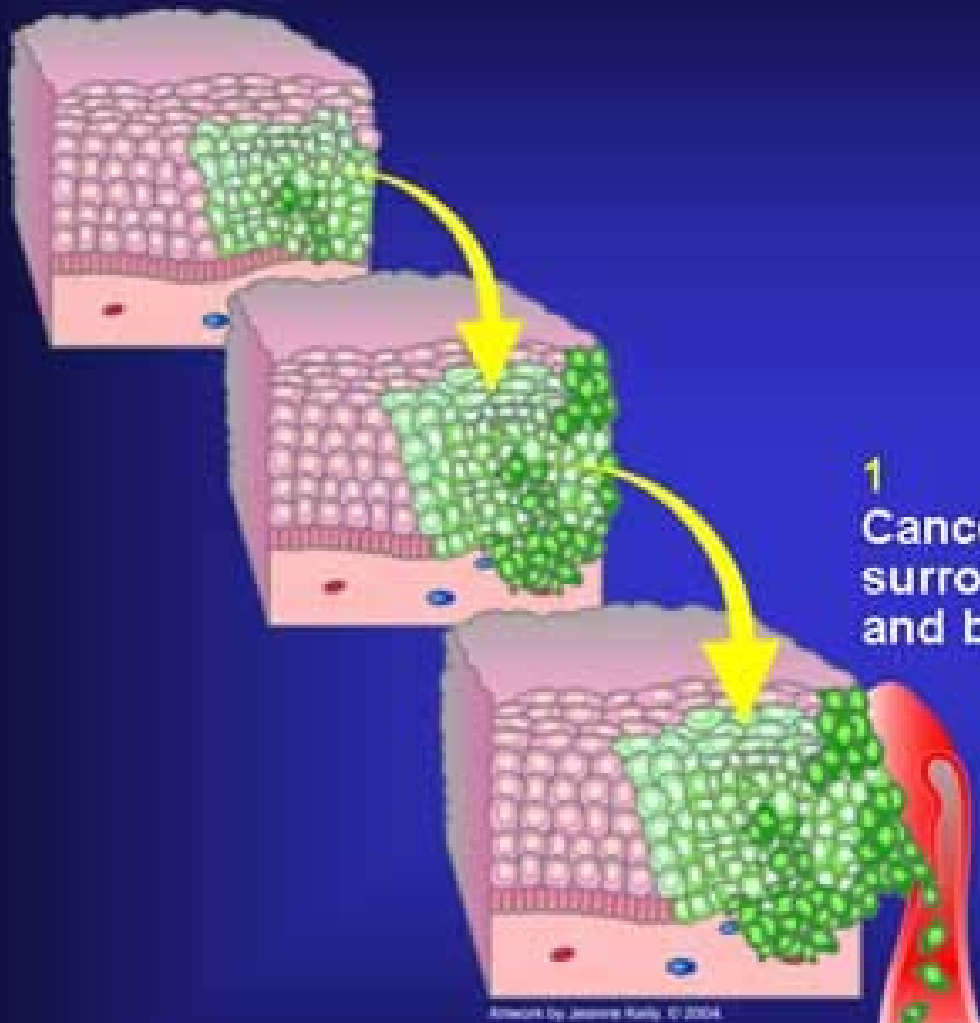
Invasion and Metastasis



1
Cancer cells invade surrounding tissues and blood vessels

2
Cancer cells are transported by the circulatory system to distant sites

3
Cancer cells reinvade and grow at new location

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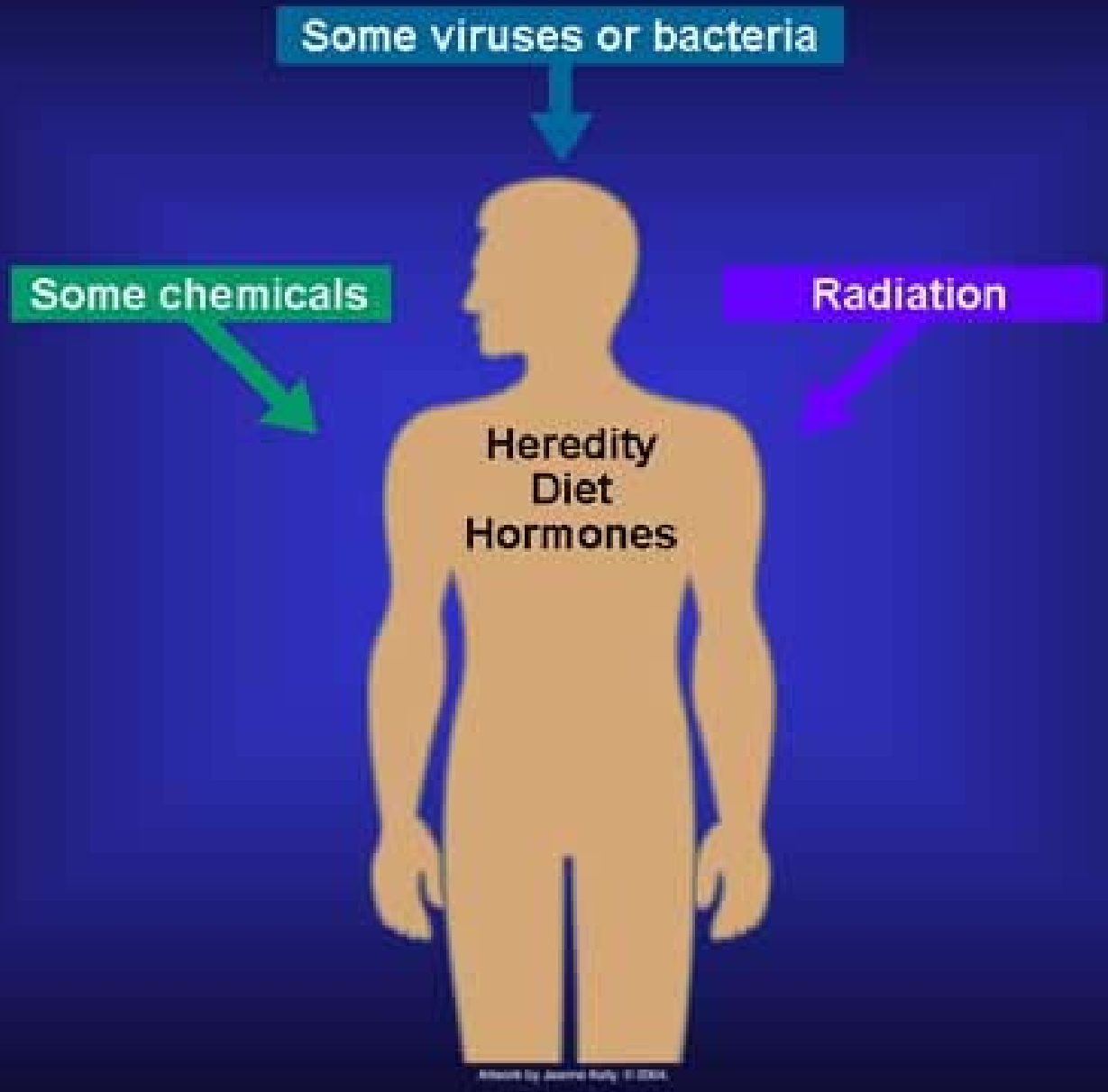
Causes of Cancer

- Mutations to the genes that control the cell cycle
- Proto-oncogenes- Genes that tell the cell cycle to go (gas pedal)
- Tumor Suppressor Genes- Genes that tell the cell cycle to stop (brakes)
- Mutations to one/both lead to uncontrolled cell growth/division

5. What Causes Cancer?



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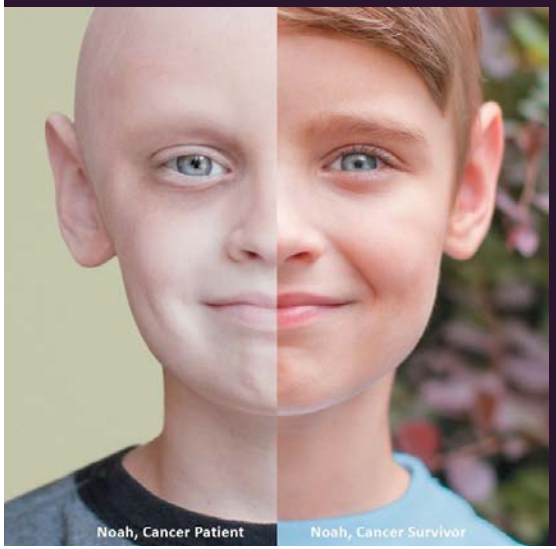
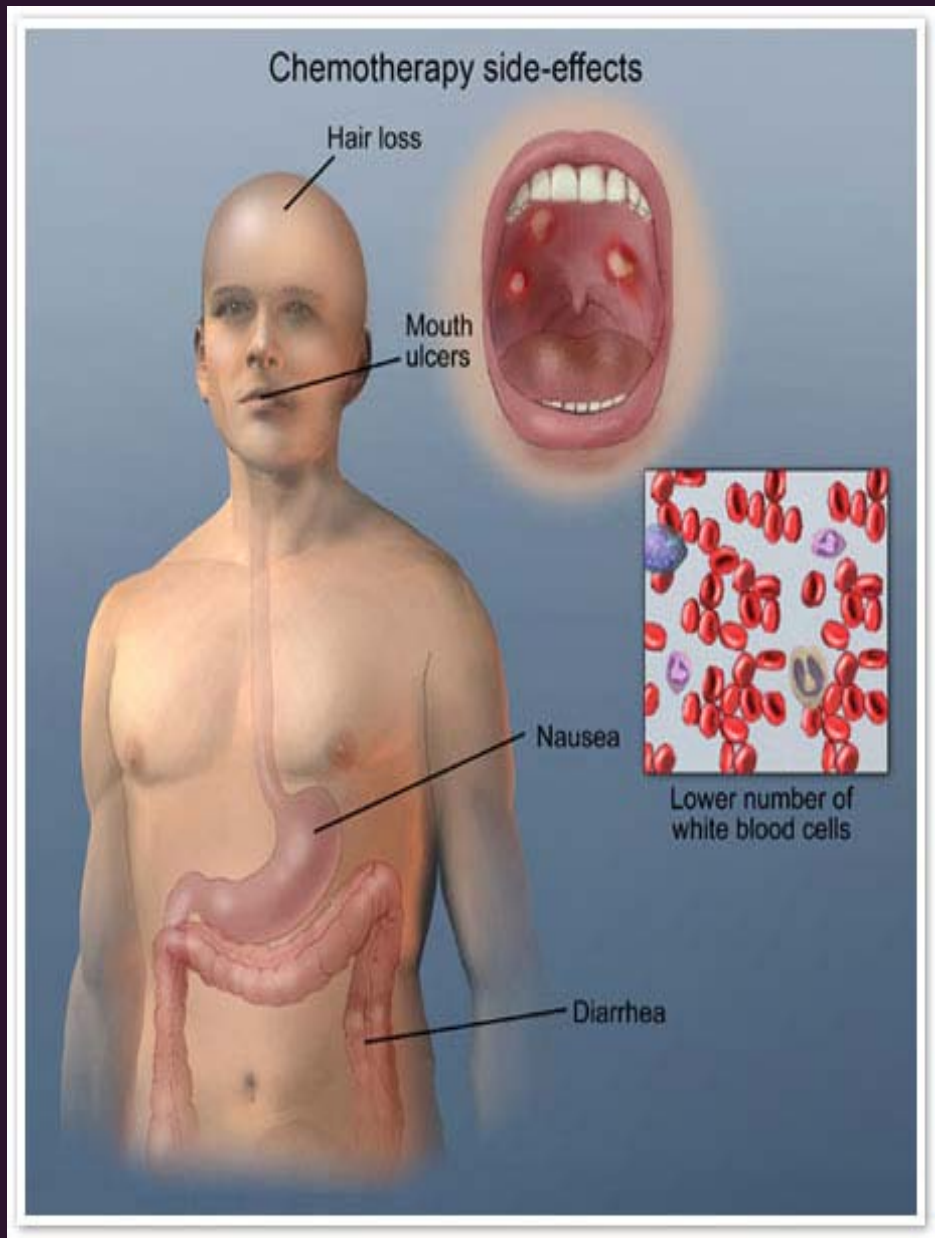
What causes mutations?

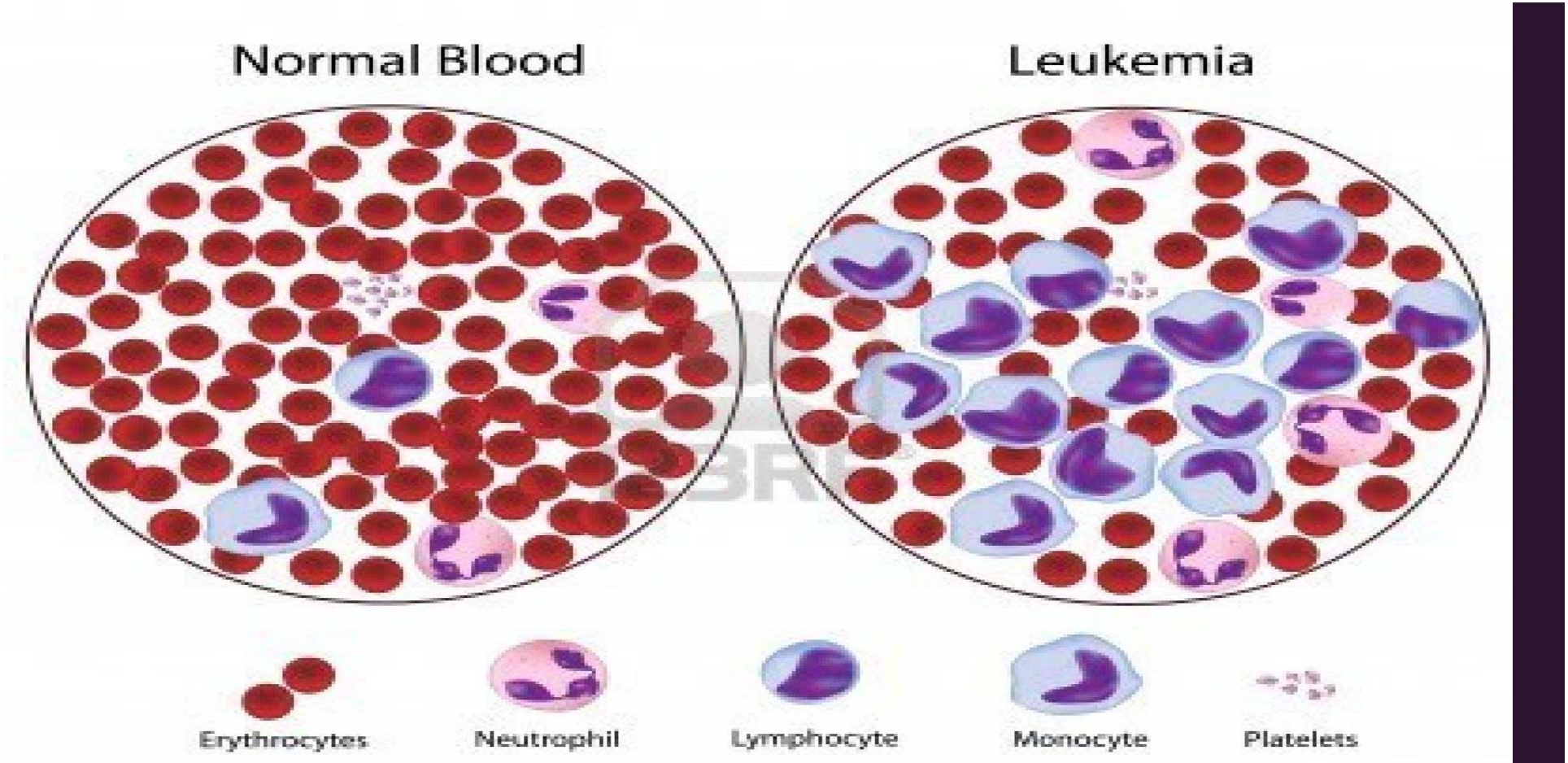
- External
  - Radiation (Gamma, UV, etc)
  - Some chemicals (Carcinogens- cigarette smoke, asbestos)
  - Viruses/Bacteria (HPV, Hep. B/C, H. pylori)
- Internal
  - Heredity (BRCA)
  - Diet (Alcohol)
  - Hormones (Estrogen)

6. Cancer Treatment

- Surgery to remove cancer
- Chemotherapy
- Radiation
- Viral Vector

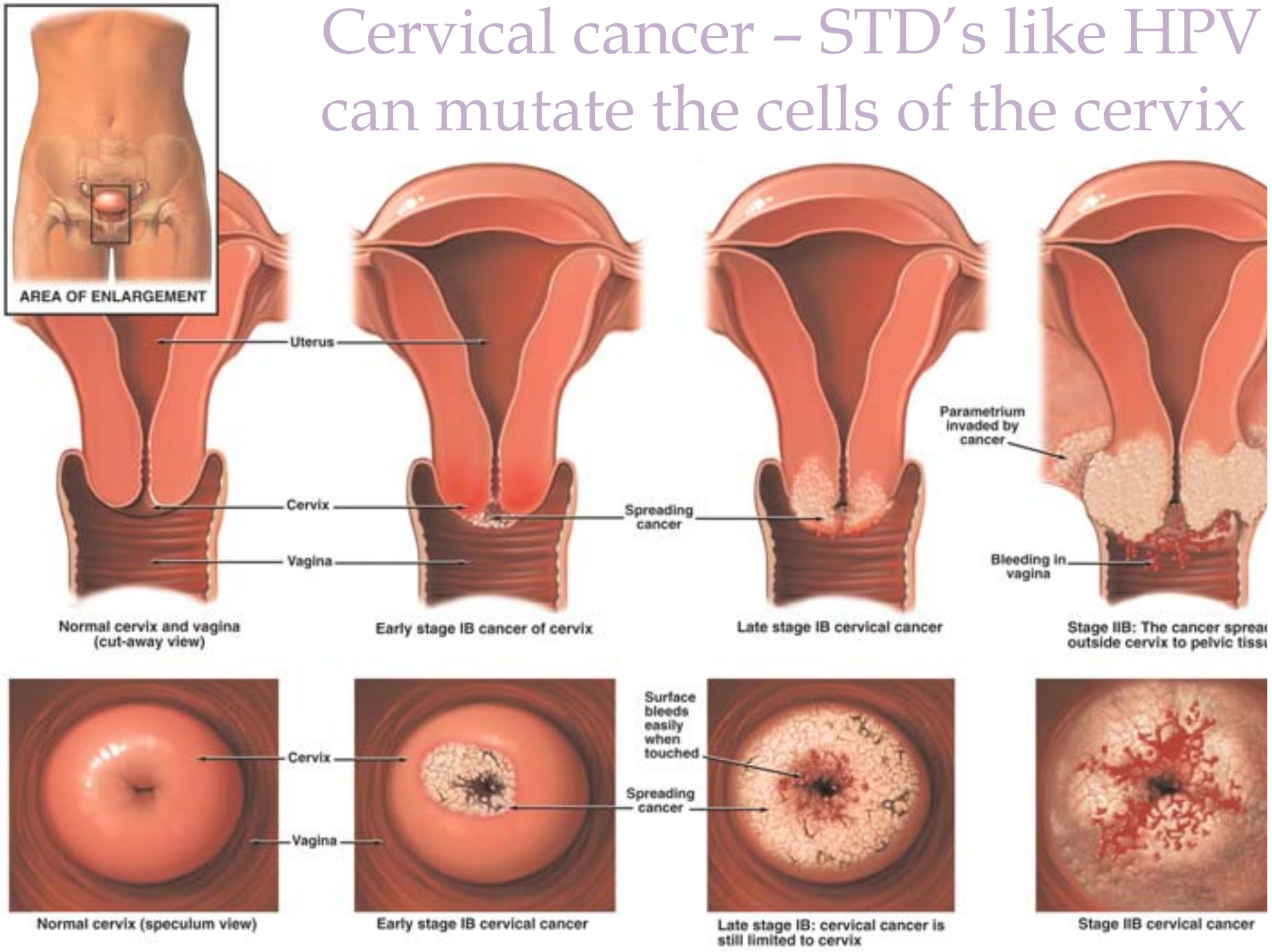






Leukemia – white blood cells divide uncontrollably, leaving no room for red blood cells.

Cervical cancer – STD's like HPV can mutate the cells of the cervix



Skin Cancer

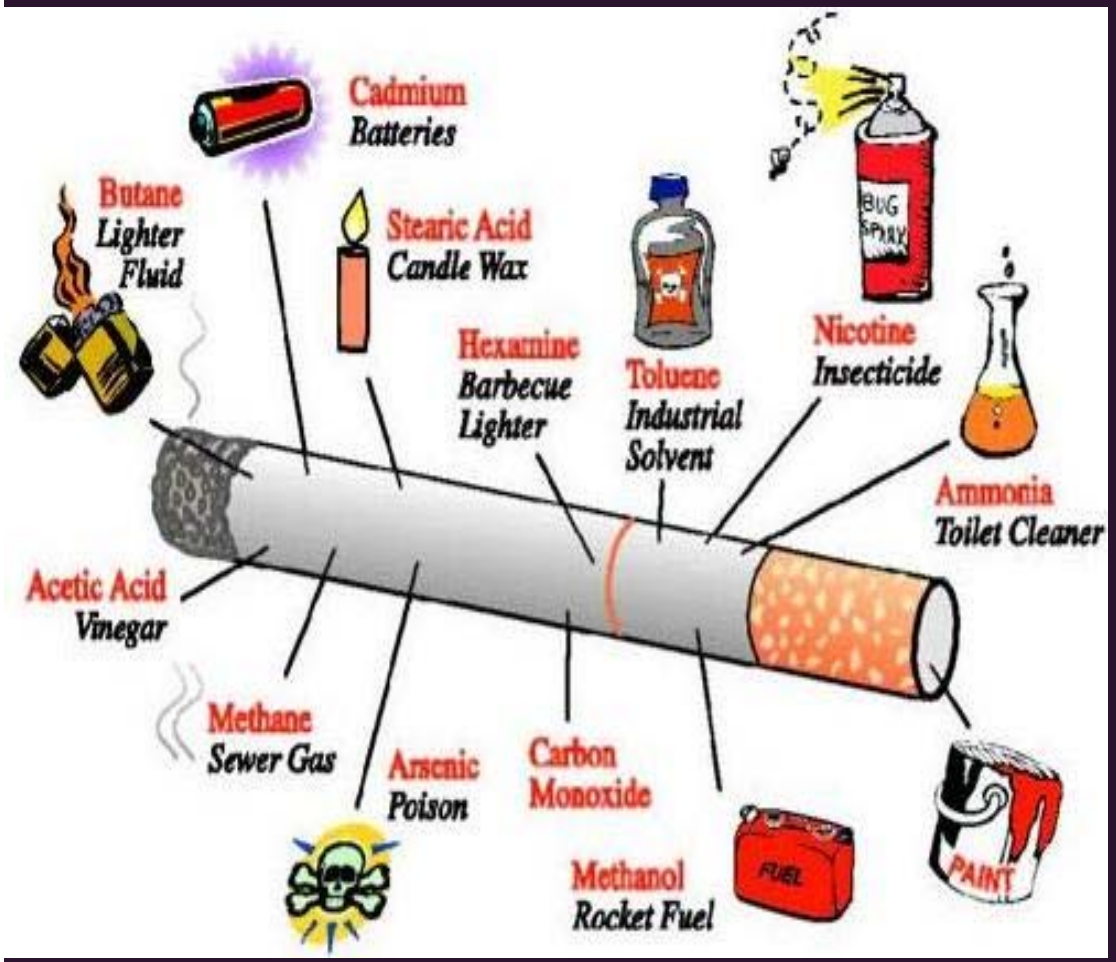
- **Skin cancer** — the abnormal growth of skin cells — most often develops on skin exposed to the sun.


NEJM.com

Lung Cancer

- Inhaled chemicals mutate lung cells to divide uncontrollably.

Oral cancer (caused by tobacco)



Don’t google search this stuff!

Smoking causes mouth cancer