# THE CANCER/MITOSIS CONNECTION





All cells have a controlled rate of division that is appropriate for their role in the body.





 ex. The cells of the skin reproduces perfectly so that it does not become too thin or too thick



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 Ex. Cells that line the intestine complete the cell cycle in 24-28 hours



 Ex. Liver cells reproduce only once a year
 (if that)



### Ex. Some Nerve cells barely ever reproduce





 Ex. Frog embryo cells reproduce in less than an hour



- Cells spend most of their time in interphase.
- The mechanism for cell growth is highly regulated by genes (segments of DNA) in the cell so that you only get the new cells you need.

If the control mechanism for this process gets messed up, the rate of mitosis in that body tissue increases



The cell cycle has checkpointswhere the cell will make sure all requirements are met before moving on to the next stage.



Specific genes in a cell control how fast the cell cycle progress.



- <u>Oncogenes</u>- speed up cell division.
- They are like the "accelerator" in a car.
- If these get mutated, it is like getting the accelerator in a car stuck. The cell will not stop dividing.



- <u>Tumor Suppressor Genes</u>- slow down cell division.
- They are the "brakes" of the cell.
- If they get mutated it is like cutting the brakes in a car. The cell will not stop dividing.



### **Increased Mitosis** ...

# Leads to Accumulation of cells in that area known as a TUMOR



### Increased Mitosis ...

- Leads to
  - CANCER

 A disorder of cells in which the genes which control growth have been damaged and the cells have the ability to spread throughout the body.

### **Ovary Cancer Cell**



## Causes of cancer:



- Viruses
- Chemicals (such as Nicotine, Benzene, Asbestos)
- Ultraviolet radiation
- Genetics







The ozone absorbs some, but not all of the types of UV radiation: UVA: Not absorbed by the ozone layer.

UVB: Mostly absorbed by the ozone, but some does reach the Earth's surface. UVC: Completely absorbed by the ozone layer and oxygen.



### UVA and UVB that reach the Earth's surface contribute to serious health effects.







These are called CARCINOGENS: cancercausing agents (also called MUTAGENS)

- Exposure to these Carcinogens is cumulative, meaning the longer you're exposed the greater your risk.
- Carcinogens attack DNA and **mutate** the genes that controls cell division

# Kinds of tumors:

 BENIGN: Harmless because do not spread to other tissues of the body
 - Ex. Warts (caused by a virus)



# Kinds of tumors:

### MALIGNANT:

- Very dangerous
- Spreads to different kinds of tissues (called METASTASIS)
- interferes with organ function



Abnormal cells found in the lining of the breast milk duct

### Normal duct



The cancer had spread to the fatty breast tissue

Stage IA





The cancer has spread far away from lymph nodes. The most common sites are the bones, lungs, liver and brain.



 Cancer cells do not carry on normal functions, all their energy goes into dividing.

They also use up the nutrients for cells so they can't do their job as well.

# <u>Cancer Treatments</u>

Surgery: removal of cancerous cells, hopefully before it can spread.
Radiation Therapy: burn and/or kill all cells in the area





## **Cancer Treatments**

**Chemotherapy:** medication that destroy all rapidly dividing cells (including cells that grow hair, line the gut, produce sperm, produce nails, produce blood cells)

If the cancer has spread (metastasized)then you would to treat the whole body with chemotherapy.



# **So**...

- There are many different forms of cancer, all with varying threat levels to a person's health. A person's susceptibility and ability to fight cancer depend on their health, physical activities, heredity, the environment they live in and access to health care.
- In short, Cancer, in all its various forms, is uncontrolled cell division that leads to a tumor with the ability to spread to different tissues in the body.