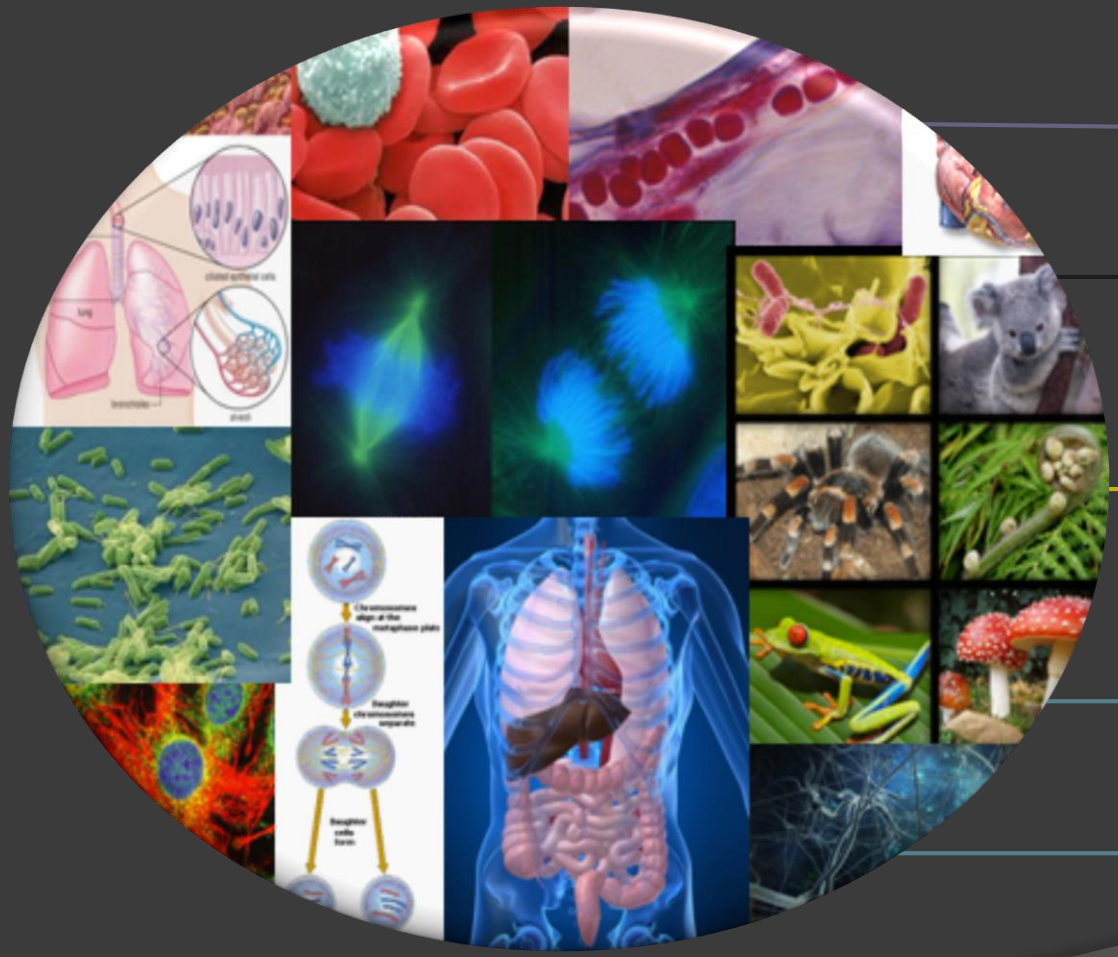
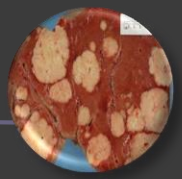
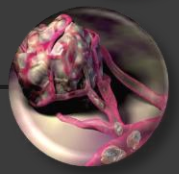
Cancer – Cell Division Gone Wrong

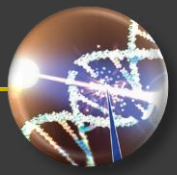




Overview



Metastasis

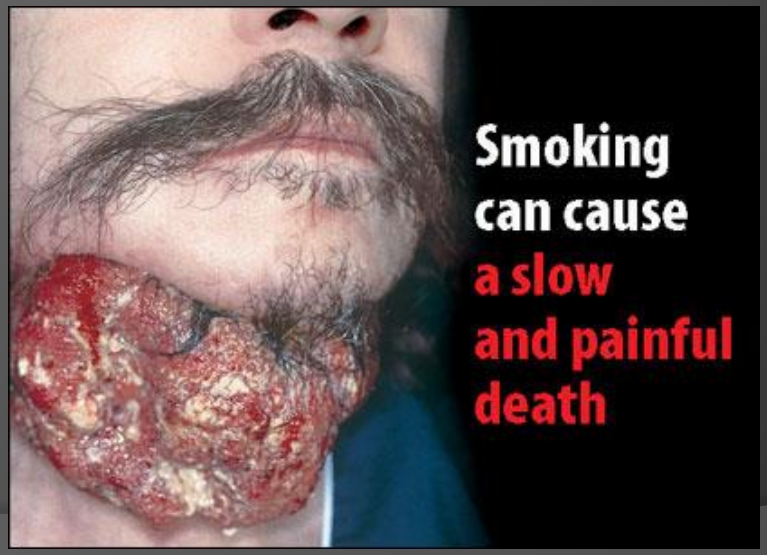


Causes

Prevention

Treatments

CELL DIVISION GONE WRONG

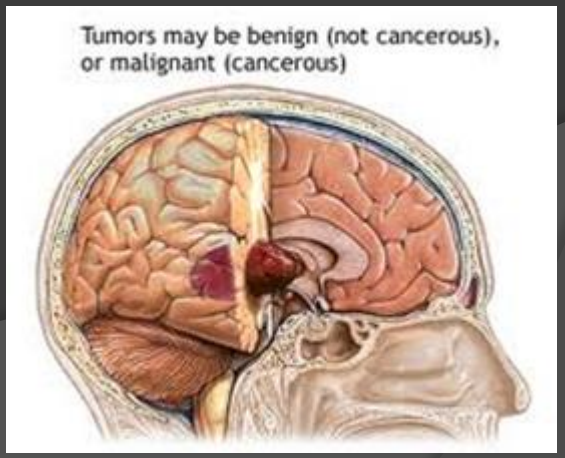


Cancer

- **A group of diseases in which cells are growing out of control**
- It results from a change (mutation) in the DNA
- All subsequent daughter cells contain the same mutation

Cancer

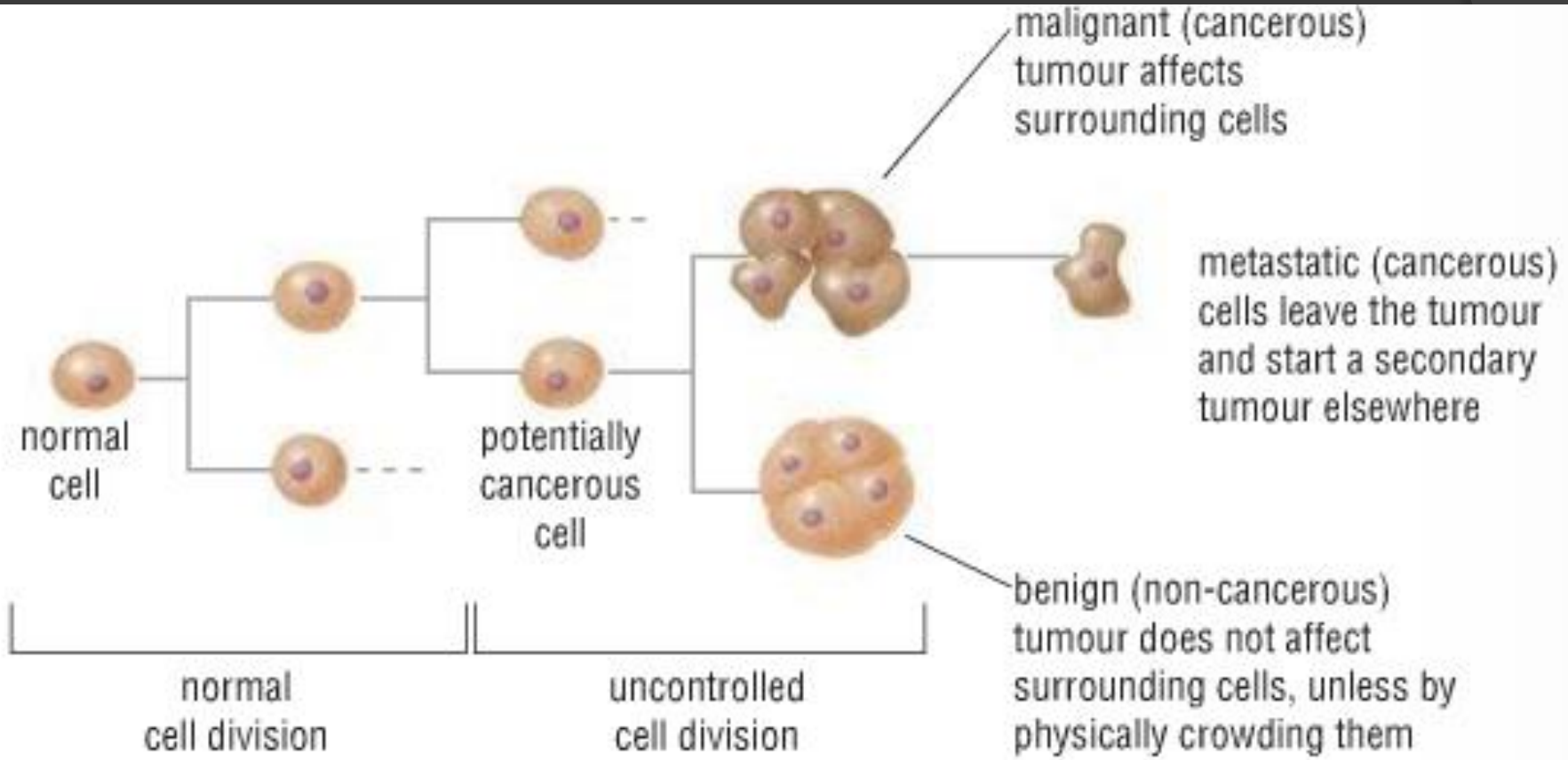
- **A cancerous cell is a cell that continues to divide even though surrounding cells are not**
- This group of cells create a lump or tumor
- **If the tumor cells stay together and have no serious effects it is called a benign tumor**



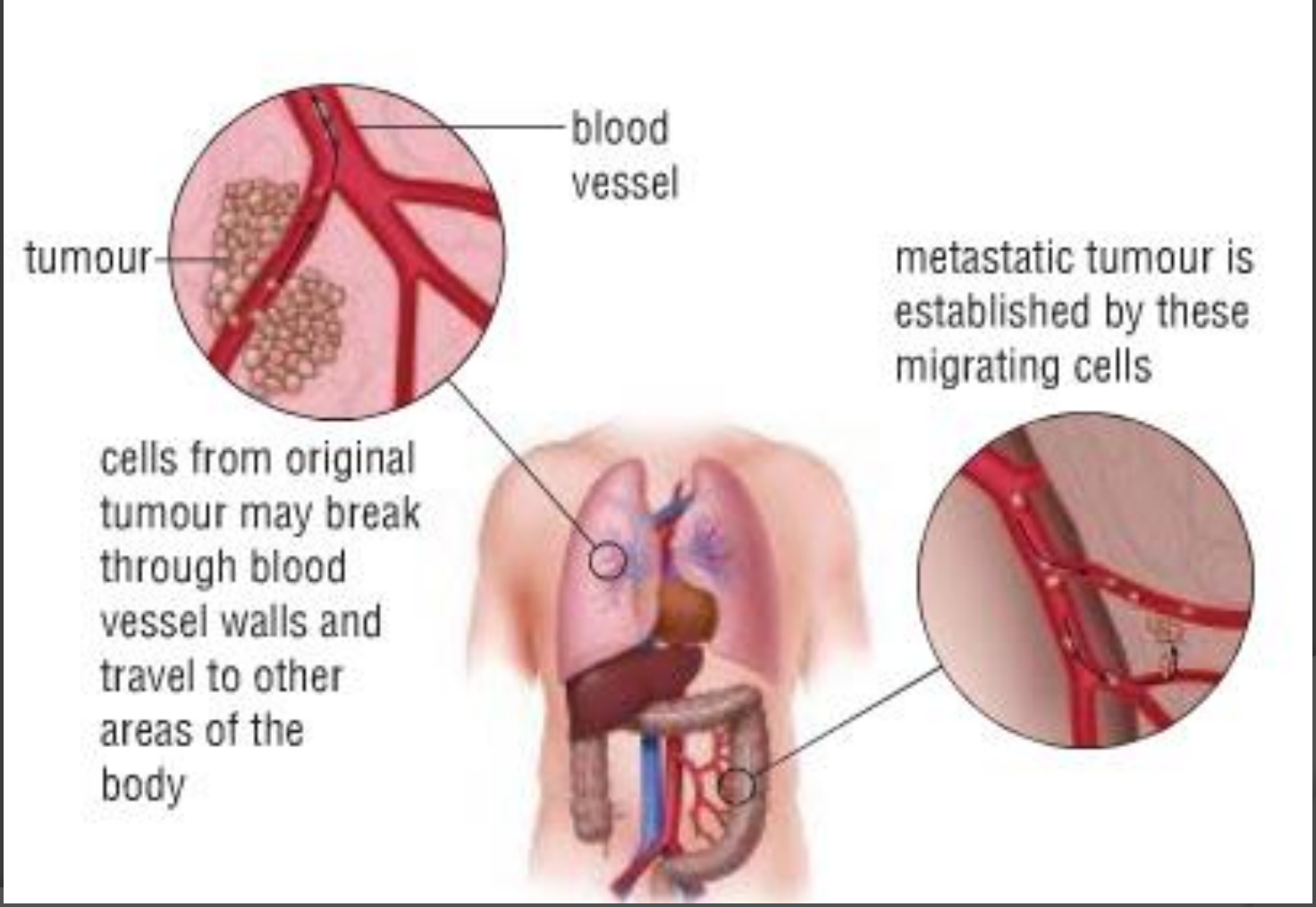
Malignant Tumors

- A **malignant tumor** is a mass of cells that interferes with the functioning of neighbouring cells
- Cancer cells can also breakaway from the original group and move throughout the body
  - Metastasis
  - Cells have metastasized

Cancer


malignant (cancerous) tumour affects surrounding cells
metastatic (cancerous) cells leave the tumour and start a secondary tumour elsewhere
normal cell
potentially cancerous cell
benign (non-cancerous) tumour does not affect surrounding cells, unless by physically crowding them
normal cell division
uncontrolled cell division

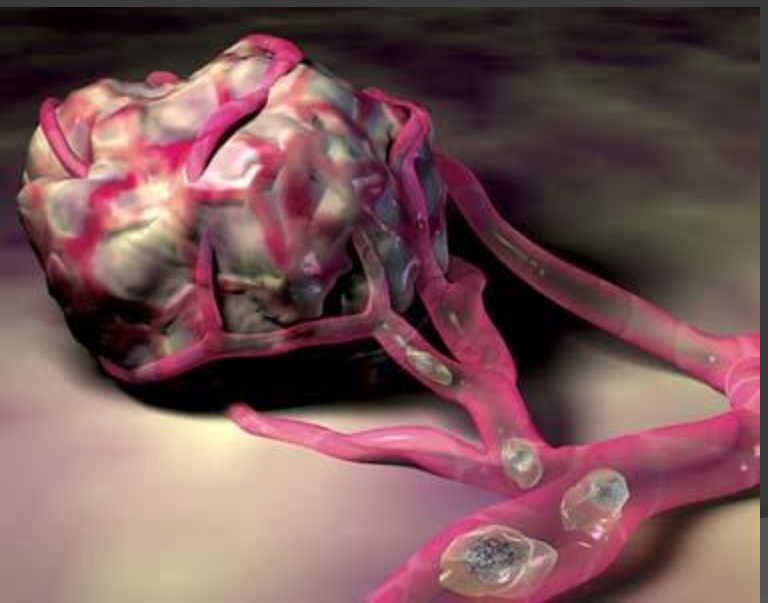
Metastasis

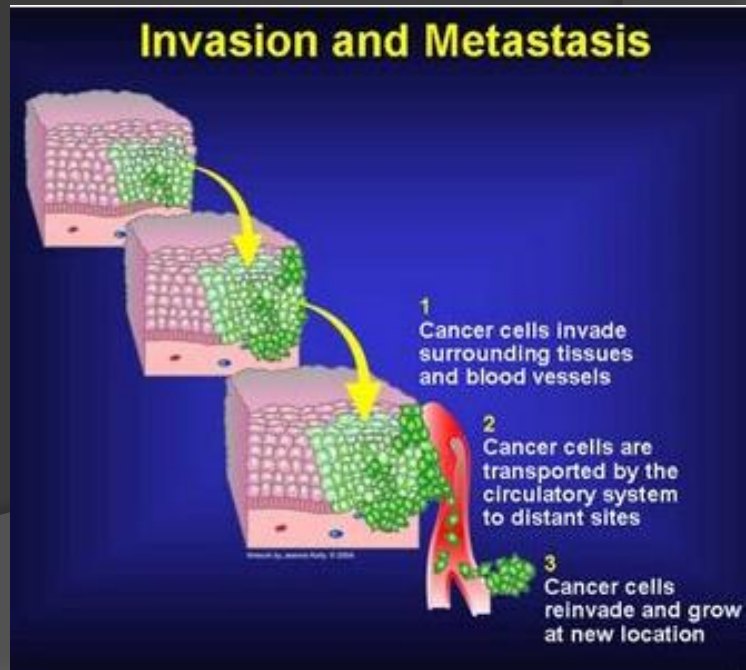

blood vessel
tumour
metastatic tumour is established by these migrating cells
cells from original tumour may break through blood vessel walls and travel to other areas of the body

Metastasis

- **<u>Parts of a tumor can break away and go to other parts of the body</u>**

- Can you think of areas of the body that might spread cancer cells more easily than others?



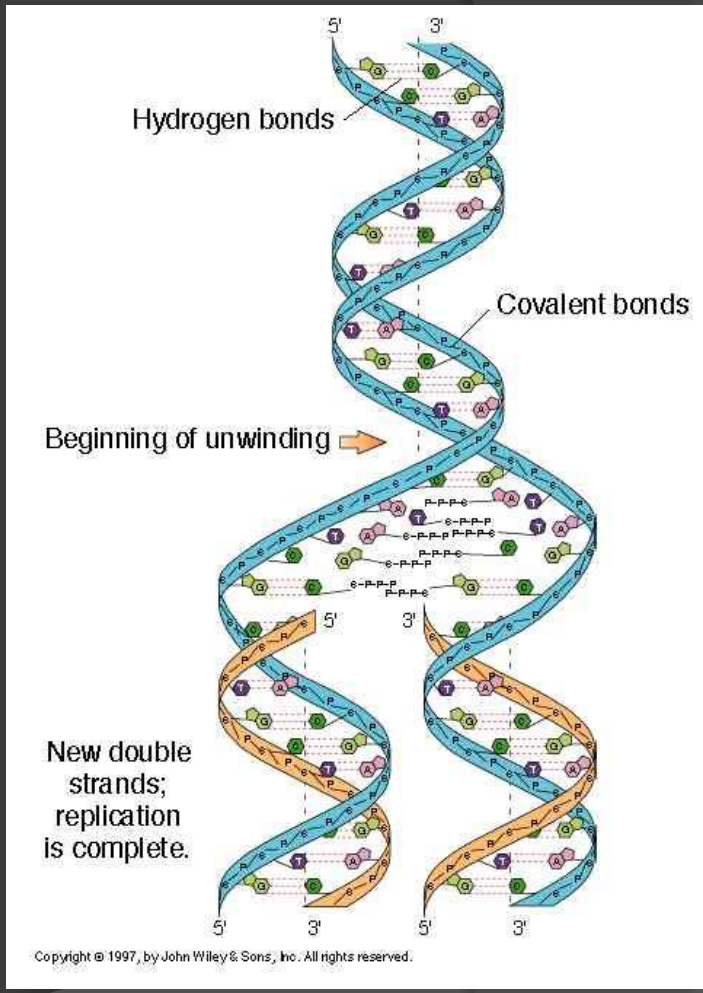


Causes

- **During cell division the DNA is replicated**

- Most of the time there are no major errors and therefore the daughter cell is identical

- Sometimes there are mutations which change the cell cycle making cell division happen much more often with no “off” switch



Cause of Cancer

- Many mutations are caused by carcinogens
  - **<u>Environmental factors that cause cancer</u>**
  - **<u>E.g. tobacco smoke, radiation, sunlight, some viruses (hep. B)</u>**

  - Just because you are exposed to a carcinogen, doesn't mean you will develop cancer

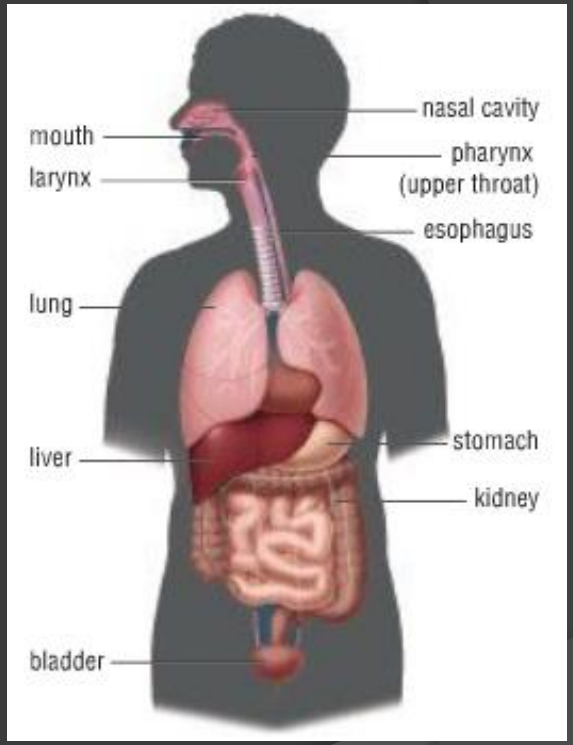
Risk Factors

- **Environmental and occupational exposures** (e.g., radiation, second-hand smoke, radon, asbestos, organic vapors, and pesticides

- Genes known to be involved or suspected of being involved in familial cancer syndromes (e.g., BRCA1)

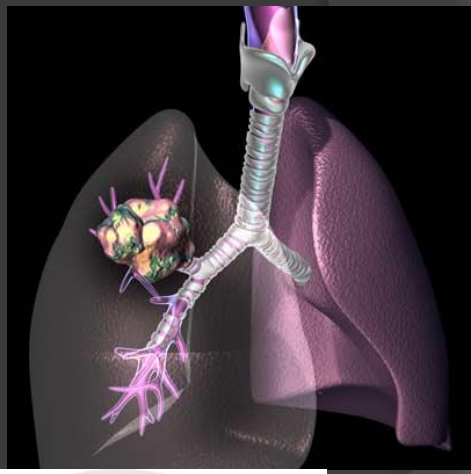
Lung Cancer

- One of the most common types of cancer
- Smoking causes **<u>9 out of 10</u>** cases of lung cancer
- Smoking also increases the risk of other cancers



Lung Cancer

So you want to smoke



Skin Cancer

- Seems very uninteresting and harmless
- In Australia it is considered to be the national cancer

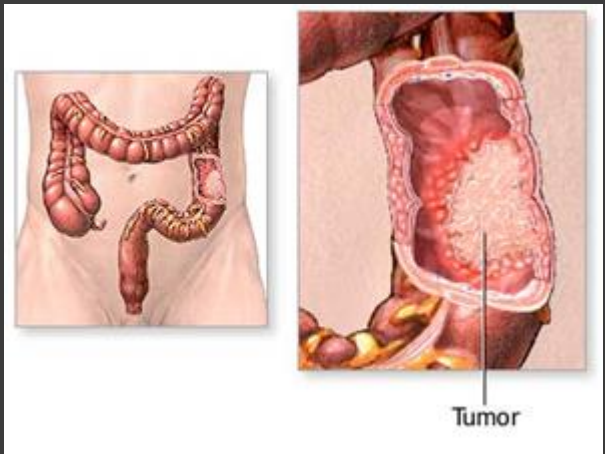
- **<u>It can also metastasize to other parts of the body</u>**

Skin Cancer

- Caused by the exposure to UV light (Sunlight and Tanning Beds!)
- UV light enters the skin cells and **<u>rips apart the DNA causing changes to occur</u>**

Other Cancers

Colon Cancer



Oral Cancer

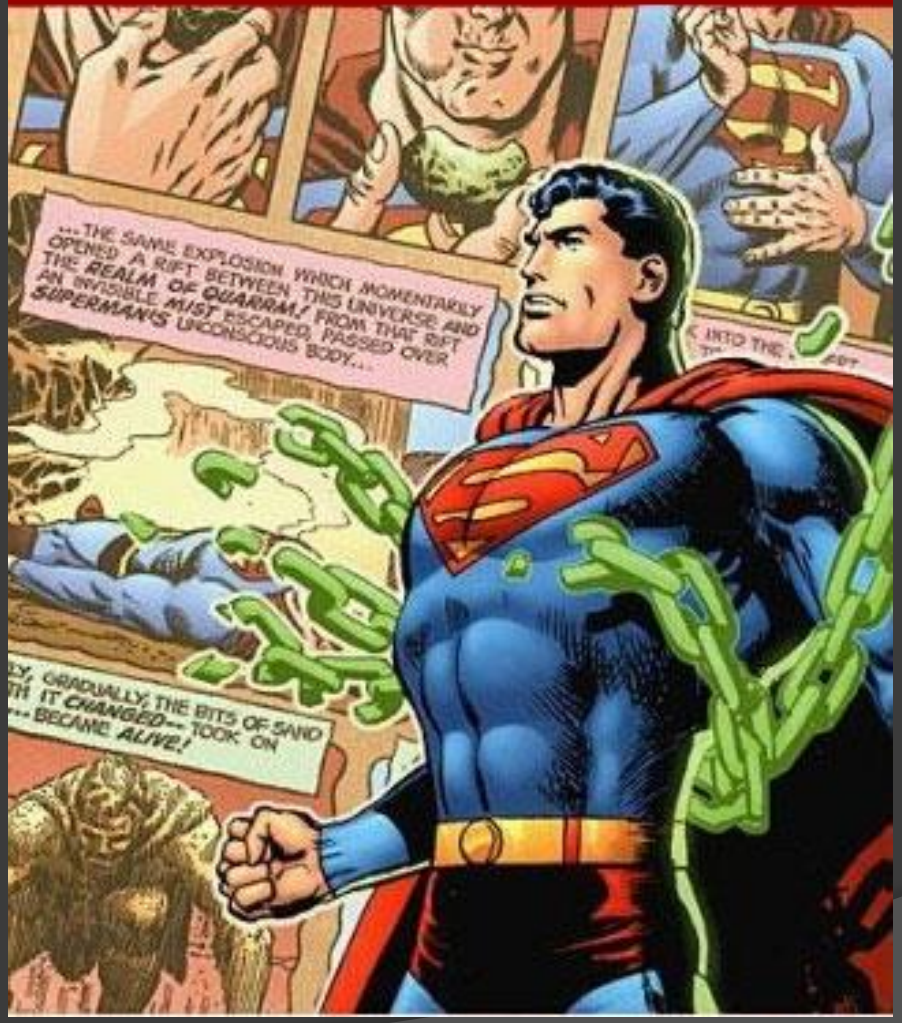
Eye Cancer

Teratoma

Ovarian Teratoma

- "Teratoma" means **"monster tumor" - This is a growth inside the body so large, it can develop hair and teeth.**

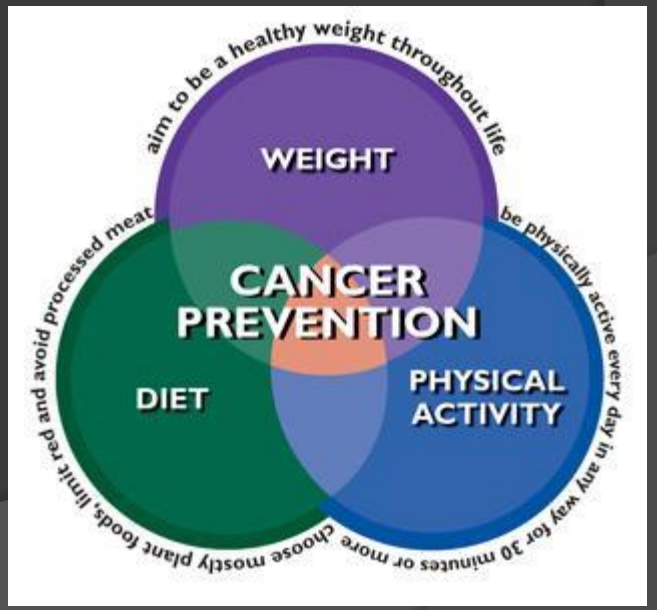
BREAK TIME


...THE SAME EXPLOSION WHICH MOMENTARILY OPENED A RIFT BETWEEN THIS UNIVERSE AND THE REALM OF QUARRM! FROM THAT RIFT AN INVISIBLE MIST ESCAPED, PASSED OVER SUPERMAN'S UNCONSCIOUS BODY...
...GRADUALLY, THE BITS OF SAND ...IT CHANGED-- TOOK ON ...BECAME ALIVE!

Cancer: Unregulated Cell Division

CAN WE PREVENT CANCER?

- Why take the chance when you can do something about it!
  - What can we do to reduce our risk of developing cancer?



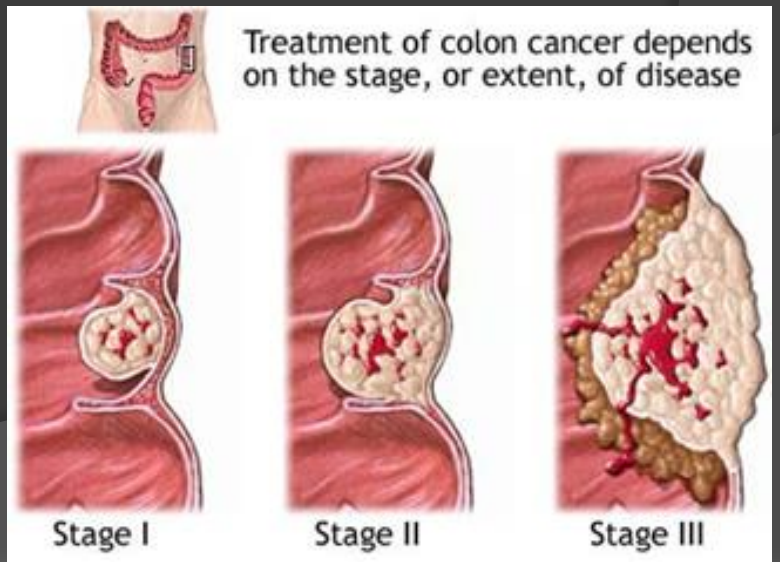
Strategies for Cancer Prevention

- **<u>Stop using tobacco</u>**
- Maintain a reasonable weight
- Increase physical activity
- Eat 5-9 fruits and vegetables daily
- Increase fiber and reduce fat
- Limit alcohol consumption
- **<u>Limit exposure to the sun</u>**

Early Detection/Screening

- Screening for cancer means looking for cancer **BEFORE there are symptoms.**

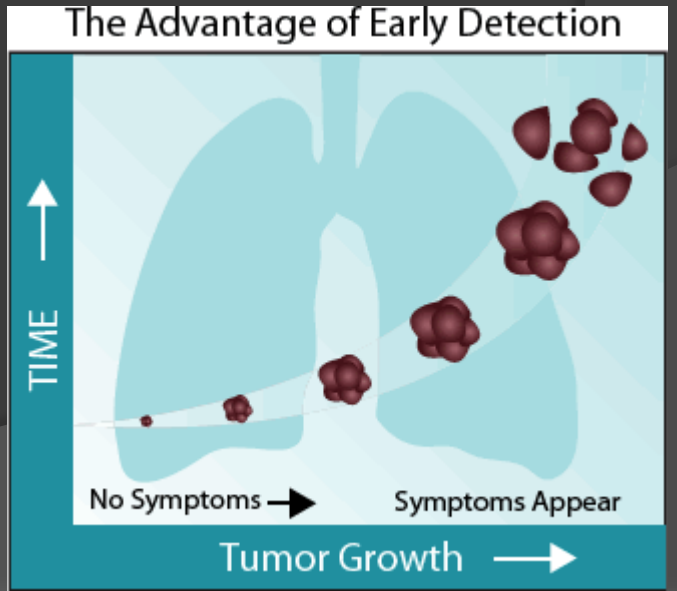
- Screening may identify early cases of cancer that might never have become clinically apparent.



Early Detection

- This is especially important if you have a family history of cancer

- The sooner your doctor finds the cancer, the greater your chances are for survival

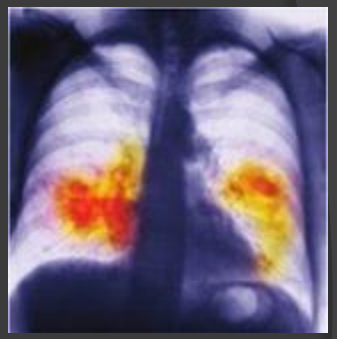


Diagnostic Tests

Some common diagnostic technologies

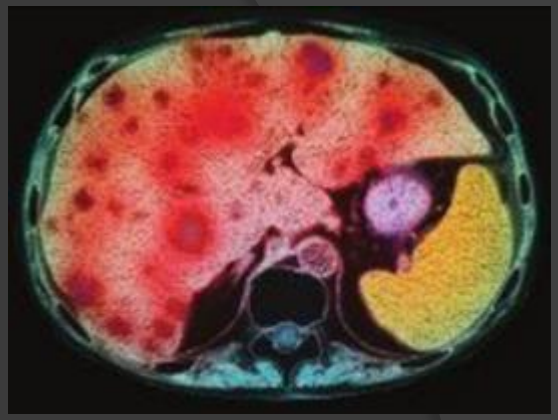
- Endoscope – camera at the end of a tube which can be inserted into an area and controlled by the doctor.
  - **<u>Allows the doctor to see abnormal growths without surgery</u>**

- **X-rays** - imaging technique that allows the doctor to view images of parts of the body. Generally the doctor will look for shadows which indicate abnormal growths

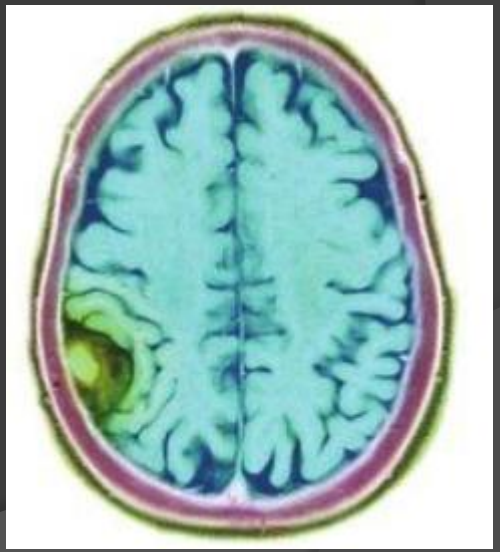


- **Ultrasounds** - creates a digital image of soft body tissues such as the heart or liver

- CT or CAT scan (**computerized axial tomography**) – Taking multiple x-rays from different angles to create a detailed image of areas inaccessible by normal x-rays



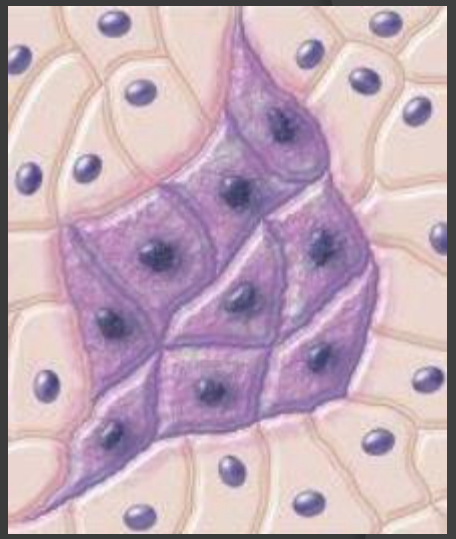
- MRI (**magnetic resonance imaging**) – radio waves and a strong magnetic field create images more detailed than a CT which then can be assembled into a 3D picture



Diagnostic Tests

- The physical exam, lab and imaging tests may identify an abnormality but a BIOPSY is the only sure way to know whether cancer is present.

- In a **BIOPSY**, the doctor removes a sample of tissue from the abnormal area or may remove the whole area. A pathologist will examine the tissue under a microscope to see whether cancer cells are present or not.



Cancer Treatments

- The goal is to slow down the growth of the tumour or destroy as many as possible

There are 3 main techniques

1) **Surgery**
2) **Chemotherapy (Chemo)**
3) **Radiation**

Surgery

- If the tumour is accessible the doctor may simply remove the cancerous cells

Chemotherapy

- Treats cancer using drugs (chemicals, hence “chemo”theraphy)
- Usually used as a first line of treatment
- **<u>These drugs slow or stop the cancerous cells from dividing and attempt to kill them</u>**

- Drugs can be injected or taken in pill form.
- Side effects include hair loss, nausea, and fatigue (why do you think this is?)
- The drugs travel throughout the body **killing all detected as well as undetected tumours**

Radiation

- Radiation therapy uses high-energy radiation (X-rays, gamma rays, and charged particles) to kill cancer cells by damaging their DNA (recall checks for cell division)

- Radiation therapy **can damage normal cells** as well as cancer cells. Therefore, treatment must be carefully planned to minimize side effects