Science 9
Biology Unit

# 2.7 Changes to a Cell's DNA

Recall DNA Replication:

DNA → gene (segment) → RNA (**carries message**) →ribosome (**reads code**) → amino acid → protein (determine **characteristics** of organisms)

What happens if the DNA is changed in some way?

Mutations: a change in the **genetic code** of a cell.

*DNA has repair mechanisms that will often repair the '**damaged'** DNA.

*if the DNA cannot be repaired, the **RNA** molecule that is constructed from the damaged DNA will contain instructions that are **altered**.

*altered instructions may direct the ribosomes to put the amino acids together in a **different order**, which will then cause a change in the **structure** of the protein.

*Mutations can be classified as **beneficial**, **neutral** (no visible effect) or **harmful**.

Genetic Diseases: diseases can be caused by harmful mutations.
Eg. **Cystic fibrosis, diabetes, cancer.**

Cancer: cells that divide into large masses called tumours.

Two basic types of tumours are **benign** and **malignant**.

Benign tumours do not interfere with normal cell function but can cause problems if they push against surrounding **organs/nerves**. Benign tumours do not invade surrounding tissue and **stay in one place**.
Malignant tumours **interfere** with normal cell function, divide more **rapidly** than normal cells (using more nutrients), and can separate from the tumour and **spread** throughout the body. The spreading of a tumour is called **metastasis**.

Cancer cells:

- have enlarged **nuclei** because they are constantly dividing.
- Use more **nutrients**
- Do not carry out the **functions** of normal cells.

Causes of Cancer: any substance that causes cancer is a carcinogen.

1. Smoking (chemicals within), **second hand smoke is worse**
2. Drinking **alcohol**
3. UV radiation or **X-rays**
4. Some viruses like HPV
5. Industrial **pollution**
6. Unknown **factors**

Additional Risk factors

1. **65+** years old or older
2. Being **obese**
3. Family history (genetic **mutations** in your family)

Treatment of Cancer:

Conventional treatment includes: **Radiation** treatment – disrupts cell division and results in the death of cancer cells, and **Chemotherapy** which uses drugs to stop cancer cells from dividing. A combination of the two may also be used. **Surgery** to remove tumours can also be an option.

**Orally**: *The problem is that there are side effects. The treatments often kill healthy cells and result in radiation burns, hair loss, nausea, etc.*

***Nanospheres**, between 10 and 100 nanometres in diameter.*
*Each sphere is made of specially designed polymers. On the outside they are coated with special molecules, called ligands, that recognise and latch onto particular types of cells. Stains are being used that selectively adhere to cancer cells so that surgeons can better isolate and remove tumour tissue to within a 200 cell thickness.*
***Hormone therapy** can be used to slow cell growth in prostate and breast cancer.*
***Hyperthermia** heats cells and causes cell death*
***Immunotherapy** utilizes the bodies natural immune system to recognize and destroy cancer cells.*