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**Cancer at the Molecular Level**

Section 1: Introduction

**Cancer** is a mass of cells, called a **tumor**, which disturb the basic unit of the human body. Tumors fall into two categories: **benign** and **malignant**. Benign tumors are not harmful to the body, whereas malignant tumors are dangerous. Malignant tumors are what makes cancer fatal. These masses that can spread easily throughout the body when not caught soon enough and can do serious damage to the body in several ways.

Key Terms:

* **Cancer**- a mass of cells in the human body caused by a genetic mutation that can replicate and harm the body
* **Tumor**- an unnatural mass of cells in the body that can either be harmless or harmful
* **Benign**- a tumor that is not harmful
* **Malignant**- a tumor that is cancerous to the body

When tumors spread to vital organs, blood vessels and bones it can be very detrimental to the working system of that specific area. For instance, when tumors are spread to the lungs, the mass of cells can potential block off airways, making the lung infected and collapse. Cancer can also spread disease to the healthy tissue in the lung, enabling it to take in oxygen. Cancer can also cause bleeding when expanded to the blood vessels. This becomes a major problem when the cancer reaches the brain and causes bleeding.

If you don’t know, scientists do not know how to cure cancer yet. This is because cancer is a **mutation** among a **genome** of which it is very hard to fully understand how to alter these mutations. The ways that scientists and doctors use to cure cancer are not definite. The outcome to whatever treatment they chose to perform is always a hit-or-miss.

Key Terms:

* **Mutation**- a distortion in DNA sequencing that occurs during cellular replication
* **Genome**- the complete set of DNA in a human body

Types of treatment for cancer include: **chemotherapy**, **radiation therapy**, and **clinical trials**. Chemotherapy is inducing a drug into the cancer patients to try and terminate the cancer cells during a specific stage in their cell growth. Chemotherapy tries to target these cancer cells and destroy them before they multiply, sometimes reaching the healthy cells therefore making chemotherapy dangerous. Radiation therapy on the other hand targets the tumor itself and is safer to the rest of the body than Chemotherapy. This procedure is done by exposing the tumors to different kinds of high-energy rays. Having clinical trials as a treatment can always differ. Clinical trials are treatments that scientists are in the process of seeing if they work by carefully testing them out on patients with their consent.

Key Terms:

* **Chemotherapy**- a cancer treatment technique which includes inducing a chemical drug into a patient’s body by IV or pills; this process destroys not only the cancerous cells, but the healthy cells too making it detrimental to the body
* **Radiation therapy**- a cancer treatment technique that exposes the body to high-energy rays that can include x-rays, gamma rays, etc. to target specifically the cancerous cells; this is safer than chemotherapy to the body, but still can do as much harm
* **Clinical trials**- a trial-and-error practice of medicine that is done with a patients consent; usually trying out new possibilities to destroy cancer cells (or any disease for that matter)

Finding ways to cure cancer is obviously the main reason for cancer research. The most important thing about cancer research is fully understanding the molecular level of cancer cells and why they do the things they do.

Section 2: Cancer at A Molecular Level

Briefly previously mentioned, cancer is a mass of cells that can be very harmful to the body. To get into more depth about cancer, it starts at the cellular level of cell replication. When a cell gets mutated in a way causing a tumor to form, it is a specific genetic mutation that causes cells to replicate repeatedly excessively. This becomes a problem because scientists cannot figure out how to genetically alter the **DNA** in a cell to make it stop replicating.

Key Terms:

* **DNA**- (deoxyribose nucleic acid); a genetic material present in all living things

To fully understand cancer (of what is there to know about), you must understand cells and cellular replication. Cells are one of the most basic, microscopic, units of the body that help the human body to work. From your muscles, to your bones, organ function and blood flow, cells make up the composition of everything. Human body cells are constantly in the process of replicating. In order to do this, they must go through a process called **mitosis**. Mitosis has two different phases, ***interphase***and the ***mitotic phase***. Interphase is when the cell starts to copy it’s DNA and then it leads into the mitotic phase where the cell then splits into two and replicates into two separate cells.

Key Terms:

* **Mitosis**- the process of cell division into two separate cells from one cell containing identical DNA
* **Interphase**- the step during cellular replication where the DNA is copied
* **Mitotic phase**- the step during cellular replication after interphase where the copied DNA is then used and split into two separate cells

Section 3: How Cancer Grows

Cancer cells do not just become malignant right off the bat, the go through a longer process to develop the mass of cells. Cancerous tumors can be developed over a long period of time stretching out to even years. After a single cell has been mutated and reproduces excessively, it then creates a bigger tumor from the mutated cells creating more and more mutated cells. This is called, **tumor progression**. From there, different cells can become more dominant than others meaning that their cellular growth rate is faster than others. After this happens, the cancerous cells can spread across the body to vital organs such as the liver, bladder, lungs, intestines, etc.

Key Terms

* **Tumor progression**- the creation of a bigger tumor from excessive cell replication

Section 4: Conclusion

Understanding how to defeat cancer is one of the biggest scientific struggles in medicine. From what scientists already know about cells, cell replication, DNA, mutations, and every small thing that ties into it.

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