Causes and effects of cancer

Health & Medicine, Cancer



In the human body, cells are constantly going through the cell cycle. An Important step of the cell cycle Is called mitosis, In which the cell (referred to as the parent cell) undergoes a series of steps that lead to the formation of two daughter cells. This process only occurs In somatic cells, which are any nongamete cells. Gametes are haploid (containing only half of a full chromosome set, 23 chromosomes vs. a diploid's 46) cells in the form of sperm (males) or ovum (females).

Some areas of the body undergo very little mitotic division at all, such as muscles and nervous tissue. Other areas undergo mitotic division in response to a growth factor, which is a signal to cells of a specific area to begin mitosis. This growth factor is released into the extracellular fluid in certain portions of the body in response to four basic stimuli: growth, repair, asexual reproduction, and regeneration. In humans, growth and repair are the prevalent stimuli. Growth dictates the maturation of an organism during a specific period of time" known as puberty in humans.

Repair, on the other and, occurs when an organism sustains an injury such as a laceration, in which mitotic division occurs to create a blood clot to seal the wound, and epithelial cells undergo the process as well to recreate the skin cells that were destroyed. To control the rate ot mitotic cell division, the body uses growth signals and antigrowth signals. cancerous cells are those that Ignore antgrowth signals, and can continue to replicate without growth factors. After a certain amount of rnItotlc dlvIslons, the telomeres In cells shorten until there Is none, and programmed apoptosis" cell death " occurs.

Cancer cells elongate their telomeres, and so can also replicate almost indefinitely. When these cells start to build up, they form a mass called a tumor. Tumors can either be benign or malignant. Benign tumors on the skin have hair growth and clean edges, whereas malignant tumors do not and are cancerous. The condition can worsen if any cells from a malignant tumor detach and travel to other parts of the body through the circulatory or lymphatic systems. The tumor will then begin growing in the location where the cell ends up. nd can be fatal In certain organs like the liver or the brain, What makes these cells especially dangerous is ngiogenesis, in which the blood vessels near a tumor grow to increase the blood supply to that area, providing necessary nutrients and oxygen to the cancerous cells and depriving nearby healthy cells. Cancerous cells also divide more frequently because the length of time a cell spends in Interphase" the "inactive" phase" is shortened. This becomes even more dangerous when considering that less time is spent on replicating the DNA so the daughter cells are more likely to have chromosomal disorders. 3.

The article presents new evidence and viewpoints regarding the formauon of malignant tumors and cells. At first, In the 90s, It was elieved that cancer was " the result of cumulative mutations that alter specific locations In a cell's DNA and thus change the particular proteins encoded by cancerrelated genes at those spots. " Of course It Is already clear that certain substances, such as tobacco, asbestos, and UV radiation, are common cancer-causers (carcinogens). wnat Is DeIng aeoatea, nowever, Is wnat erect tnese suostances nave on cells that cause malignancy in the first place" or" What makes these substances carcinogens? In regards to the DNA mutation theory, evidence stemmed from observations of tumor suppressors and oncogenes. These two genes inhibit a cells' ability to divide, and stimulate growth respectively. DNA mutations would either disable tumor suppressors, or " permanently lock oncogenes into an active state. " While still supported by a few in the field, disagree. " No one questions that cancer is ultimately a disease of the DNA. " There are, however, a substantial amount of other factors that have been observed to vary between normal and cancerous genes.

Opponents of the dogma feel that " Cancer is a consequence of a chaotic process, a combination of Murphys Law and Darwin's law; anything that can go wrong will, and n a competitiveenvironment, the best adapted survive and prosper. " Age is a significant risk factor for cancer, as it is for most diseases. The older you are, the more likely you are to be diagnosed with cancer. On hypothesis that differs from the cumulative-mutations theory says that there are five or six regulation systems that need to be affected in order for a cell to be malignant.

These six " special abilities" are: growth in the absence of growth signals, continued growth despite anti-growth signals, evasions apoptosis, ability to coopt blood vessels to branch off towards the mass, near-indefinite replications, and metastasis. Of the six, it is metastasis that provides the most difficult aspect to counteract, as different drugs and treatment methods have to be utilized based on the region in which cancer is preset. For instance, chemotherapy is not very effective for bone cancer.

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Causes and effects of cancer – Paper Example

Very few cells in a tumor have the ability to metastasize, however, once detected it is usually too late. " The prominent paradigm for 25 years has been that tumors grow in spurts of mutation and expansion. " Mutations affect genetic material in such a way that usual regulatory proteins are unable to be synthesized properly, or at all. Once mutated, cells then expand and replicate much faster than normal cells (explained in the background section). It is, however, much easier to permanently activate an oncogene than it is to suppress the tumor alleles (one mutation rather than two).

It is, however, now believed that cancer is not just caused from mutations to a few specific genes. If " Just a small fraction of the cells in a tumor are responsible for its growth and metastasis," the " cure" for cancer is much more easily attainable. Seeing as mitosis produces two genetically identical daughter cells, DNA mutations present in the arent cells should also be observable in both daughter cells. Most tumors are not actually masses of identical clones; instead, there is an " amazing genetic diversity among their cells. While there are some commonly-mutated genes from cancer cell to cancer cell (like p53), " most other cancer genes are changed in only a small fraction of cancer types... " Aneuploidy is a term describing abnormalities in chromosomes. " If you look at most solid tumors in adults, it looks like someone set Offa bomb in the nucleus... there are big pieces of chromosomes hooked together and duplications or osses of whole chromosomes. " The issue though, is that most cancer cells's genomes are unstable as wells as aneuploid, and so the new introduced problem is whether mutations or aneuploidy occurs first in a cancerous cell.

One of the three plausible answers is the modified dogma. This states that some external or internal factor disables the genes needed for synthesizing and repairing DNA, resulting in an ty to correct mutations that occur. Another option Is " early InstaDility," stating that there are specific master genes required for a cell to divide, and these are silenced. Thus, when chromosomes replicate and mistakes occur, the daughter cells fail to get the correct number of type of chromosomes. As replication continues, so do the " results" worsen.

The last theory is the " all-aneuploidy' theory, in which a cellular division error produced aneuploid daughter cells that have varying amounts of different genes. The specific genes that code for enzymes which correct DNA mutations are unable to be synthesized, and thus the DNA begins to fail and kill the aneuploid cells with it. 4. While on the longer side of the spectrum, Gibbs' article is well-written, detailed, and incredibly informative. Above all, the article is also relevant" both to our current unit in AP Biology, and in the medical field.

The article is about ten years old at this point, however, much, if not all, of the information described and provided is still highly accurate and in question today. While there have been numerous developments in the biotechnology fields specializing in treatment and detection of cancer, not many advancements have taken place in regards to identifying the reasons why certain substances are carcinogenic. Mitosis and meiosis are subjects that go hand in hand with cancer, as it is literally an ncontrolled amount of mitotic division, making the article easy to relate too. New terms such as oncogenes and tumor suppressors are well explained, and numerous links to previous material (such as protein synthesis and chromosomal disorders) can be made by any knowledgeable AP Biology student. Comprehension was not an issue whatsoever, and the article was wonderfully written as well as fascinating. That said, I would highly recommend the article to anyone" AP Biology student or otherwise, as it is informative in layman's terms, as well as important in modern society.