

The development of cancer biology essay

[Science](#), [Biology](#)



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IntroductionCancer is one of the most deadly diseases found among humans. It is caused by the mutation of cells caused by either environment such as cigarette smoke and sunlight, inherited from parent or randomly in a certain arena of the body or muscle which blocks the organ from carrying out its functions as normal. If the DNA sequence of a gene is mutated it will be permanent. A mutation in a sequence of a gene's DNA can change the amino acid sequence of a protein encoded by the gene. In other words mutation means a gene is missing or destroyed, also that so much protein is produced e. g. a notification that protein is switched on permanently or that protein hasn't been produced at all e. g. proteins that controls the cell is been

switched off. A single mutation can have a large effect, but in many cases, evolutionary change is based on the accumulation of many mutations with small effects. Mutational effects can be beneficial, harmful, or neutral, depending on their context or location. Most non-neutral mutations are deleterious. In general, the more base pairs that are affected by a mutation, the larger the effect of the mutation, and the larger the mutation's probability of being deleterious. For mutations to affect an organism's genealogy, they have to: 1) Occur in cells that make the production of offspring. 2) Affect the genetic material. Eventually, the interplay between inherited mutations and environmental pressures generates diversity among species. This is an example of human mutation which have caused the red blood cell to be shaped in a sickle pattern known as sickle cell anemia.

<http://web.mit.edu/saraht/Public/8>.

592FinalProject/Population_genetics/Mutation_files/sickle_cell.jpg Sickle cell anemia is a genetic disease caused either by inheritance or environmental cause which can occur when a codon in the amino acid is substituted or deleted during DNA duplication and this is called a frame shift mutation that will lead to a different reading of amino acid. An example is, if the normal sequence is CCC CAG AGA (giving an amino acids reading of proline, glutamine and arginine) then insertion occurs (in red) leading to the sequence CCG ACC AGA GA, the corresponding amino acids will change to proline, threonine and arginine and will shift which bases are in the codons in the rest of the RNA read after this sequence. (1)

There are two types of mutation which are point and chromosomal mutation that causes many types of diseases.

(2)

Types of DNA mutation and its impact	Class of mutation	Type of mutation	Description	Human diseases linked to this mutation
Point mutation	Substitution	One base is incorrectly added during replication and replaces the pair in the corresponding position on the complementary strand	Sickle-cell anemia	
Insertion	One or more extra nucleotides are inserted into replicating DNA, often resulting in a frameshift	One form of beta-thalassemia		
	Deletion	One or more nucleotides is "skipped" during replication or otherwise excised, often resulting in a frameshift	Cystic fibrosis	
Chromosomal mutation	Inversion	One region of a chromosome is flipped and reinserted	Opitz-Kaveggia syndrome	
	Deletion	A region of a chromosome is lost, resulting in the absence of all the genes in that area	Cri du chat syndrome	
	Duplication	A region of a chromosome is repeated, resulting in an increase in dosage from the genes in that region	Some cancers	
Translocation	A region from one chromosome is aberrantly attached to another chromosome	One form of leukemia		

Development of Cancer

Cancer most commonly occur in found in the form of lung, breast, brain, skin, cervical, prostate, stomach, testicular and kidney, but the body is capable of developing a tumour which is made up of a mass of abnormal cells that divide contentiously. The diagram below shows the difference between the division of a normal cell and cancer cell. At the start one cell start to divide uncontrollably which then becomes cancerous. The cancerous

cell divides rapidly, building a mass of cells- the primary tumour – which will affect the normal cells surrounding to it. The process of metastasis. A cluster of cells moves freely from the primary tumour through the blood or lymphatic system to another part of the body. Fortunately, very few of these cluster of cells, about one in ten thousands, are able to develop themselves and create a secondary tumour. Nearly 60% of people who are diagnosed with cancer are found to have well-established secondary tumours.

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[jpg](http://www.cancer.gov/PublishedContent/Images/images/documents/cancer4-new.jpg)Alternative therapies are used in place of conventional treatments. It is used either because conventional are not benefiting or patients might have advanced cancer diseases. Therefore they aim to look for a treatment that will cure cancer and allow patients to have a longer life span. They can also be used to make patient's lives more comfortable. Some cancer patients turn to alternative treatments if drug therapies have failed or if they believe drug therapies are harmful to the body. Biologists are trying their best to minimize the number of deaths that occur as a result of cancer diseases by relying on testimonials as anecdotal evidence that alternative therapies are effective

There are many different opinions about how effective these therapies/ treatments are and whether they are as successful as drug treatments.

Scientists haven't come to a conclusion yet on whether the alternative therapies are proven to be effective or if they have improved patient's lives. I will research these therapies and effectiveness of them in this report. The general form of therapy used to treat cancer is surgery, chemotherapy using radioactive waves and radiotherapy to kill cancerous cells in the body before

they duplicate themselves and spread afar. They are contentiously being improved by research and have varying success rates. Specialists of cancer have agreed that half of cancer is treated using surgery, 40% by radiotherapy and 4% by cancer drugs. Figure 3. 2: Brain Cancer (C71), Age-Standardised One-Year Relative Survival Rates, England and Wales 1971-1995 and England 1996-2009. In the figure above, we can see that the survival rate of brain cancer is increasing unlike other cancers. Looking at the men, one-year rates of survival relative of brain cancer has increased from 19% in 1971-1975 to 41.5% in the time of 2005-2009 which implies that the number of survival is doubled during 38 years. Looking at the women, the rate of one year relative survival has increased from 20% to 41.5% consequently. As a result of this it suggests that the treatments are successfully working on brain cancers. (3)

Chemotherapy

Chemotherapy is used as the first line of treatment to check the growth and the spread of cancer. It is said to be well responding to some cancer diseases and it can be done after surgery or radiation to prevent brain tumour from coming back. Also it can be taken orally as a pill or an injection to the tumour, muscle or vein. There are many types of chemotherapy therefore a disease type has to be determined in order to use one of the types of this therapy. Also not all tumour types work on chemotherapy. Chemotherapy drug aims to get hold of the tumour. Anticancer drugs can hardly access to some areas of the body, therefore they are well-chosen when the doctor finds out the route that will be taken. For example, the blood-brain barrier refers to the ineffectuality of some anticancer drugs to be

delivered through the bloodstream and take the path that leads to the brain or the fluid surrounding the brain. A phenomenon called sanctuary effect; this is developed when a specific drug cannot approach some areas of the body that is diseased. Expressly, the tumour is flourishing as it is out of the chemotherapy way. However this problem can be solved by looking at the diseased area and considering the most effective way to deliver the drug and this can be determined by a specialist. There are many ways of giving the anticancer drugs. To get the drug traveling to the tumour a doctor has to look at these ways below in order to deliver the drug successfully" Orally (by mouth), injecting a intramuscular chemotherapy into the muscle, intravenous (IV) injecting a subcutaneous into the vein directly, intra-arterial (into the arteries), intralesional (directly into the tumor), intraperitoneal (into the peritoneal cavity), intrathecal (into the spinal fluid), topically (applied to the skin)." One of the methods that Chemotherapy uses is giving an injection via the Intravenous which may be managed sporadically or constantly. The idea of a continual flow is to raise the effectiveness opposing the tumour or to lower toxicity. Some drugs perform more effectively when exposed to the cancer over a period of time, making a continuous flow more desirable." We've funded many of the world's most successful trials of new treatment for children with cancer, and this has contributed to childhood cancer survival rates rising to an all-time high." Scan of brain Childhood brain tumour is said to be the area that has the slowest progress. MYCN gene is an essential gene for normal cell growth but also it has the ability to cause cancer including brain tumour when it's damaged.

Radiotherapy

Radiotherapy is used for verity of cancer diseases. It is the main treatment for brain tumour when the surgery to remove the tumour does not work. It can be also used after surgery in case if the there are some cancer cells are left. Radiotherapy is a radiation treatment with a high-energy that stops the abnormal (cancerous) cells from dividing which results with destroying them; however it can do a slight damage to normal tissues. In order to reduce this damage, the amount and type of radiation that patient receives are carefully calculated. Radiation works by damaging the DNA of the cancerous cell and this damaged DNA is destroyed by two types of energy phonon or charged particles." The Cochrane Collaboration is an enterprise that rivals the Human Genome Project in its potential implications for modern medicine" It has said that there isn't enough evidence from trails to show that radiotherapy has the same ability as surgery to treat groin nodes in early vulvar cancer. Dr Swamy said. " With development of TrueBeamSTx and Precision Artiste in 2000, radiotherapy has become far safer and effective in the treatment of cancer. For example, earlier, prostate cancer could not be treated with radiotherapy, but now radiotherapy and radiosurgery are becoming the preferred modality of treatment for prostate cancer," This implies that therapies are under development and oncologists are still trying to find a cure for cancer and aiming to give long-term benefits to people. The advantage of radiotherapy is that it can be given before surgery to shrink the tumour or after surgery to stop the growth of cancer cells. Also it can be given before, after or during chemotherapy to improve overall result. A new version of radiotherapy is made known as linear accelerators, it is very

effective, has fewer side effects and more accurate than the conventional treatment. It has treated almost half UK patients at some stages. A radiotherapy mask keeps the patients head as still as possible during treatment. This makes sure that exactly the right area is treated. The mask will be made before the treatment is planned. It allows patients to see and breathe normally, but it may make some people feel claustrophobic. For some high-grade tumours, a smaller dose of radiotherapy is given to the whole head. In this case, a mask isn't needed to help pinpoint the treatment, but is still used to help keep the patient still for the treatment. Dr Michael Williams, a radiologist and chair of the national advisory group, have said; 'we are continually being told that machines are expensive, but if you compare radiotherapy to the cost of surgery, it is very cost-effective,' This covers the whole of your face and the front of your head. This mask or shell is usually made from perspex (a type of plastic) or from a type of mesh plastic, which is moulded to fit the shape of your face. http://www.christmanco.com/admin/uploads/project_images/27_689389.jpg

Alternative therapy (Antineoplastons)

Antineoplastons are an alternative therapy developed by Stanislaw Burzynski, M. D. Ph. D. Antineoplastons works on close to one hundred different genes. Also it targets the specific gene that allows cancer to grow and flourish. Antineoplastons are a group of synthetic chemical compounds that are made up of peptides and amino acids initially taken from blood and urine. It is designed to protect the body from diseases and cause cancer cells to revert to normal cells. Antineoplastons is described by the Department of Defense as " If the therapy is stopped, the normal cell will once again behave

like a cancer cell and take on a remarkable immortal quality—only the patient dies, not the cancer cells." It is one of the promising therapies thus it is said to be having a real effectiveness as it's been used by a few human clinical trial which was on 7 patients with brain tumours that had a response to treatment (In 1991). However it remains dubious. Most oncologists believe there is a lacking of evidence to encourage the use of Antineoplastons unless there is a proof of clinical trials that provide reliable information on how safety and effective it is. The main disadvantages of Antineoplastons are truly expensive that has a costs in the tens of thousands per year and patients will not be able to receive the treatment unless they travel to Dr. Burzynski's clinic in Houston, Texas to collect treatment." More recently, M. D. Prados et. al. Reported preliminary results of a phase II trial of phenylacetate in recurrent gliomas. (1996 ASCO abstract 288). 2/23 patients had a partial response and 3/23 had a minor response." (3)Although there were a few responses from patients, it is still a very low level of cure in ratio with the response received in reaction to other forms of therapy. It does not mean that if there were a response from patients this treatment must work on all cancer patients. Each body has its own different reactions and responses. Therefore this treatment might work on some but not on others. As a result of this oncologists are trying their best to develop the treatment.