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Abstract

Cancer is one of the most dangerous diseases in the world. The most famous cancer treatment is still using chemotherapy and radiation. Treatment with chemotherapy and radiation methods have some side effects, such as hair loss, decreased immunity, nausea, and vomiting. However, this treatment also need substantial costs. In 2007 appeared a new technology that oriented in cancer treatment. This technology is based on static electricity. The devices is installed in the clothes that made-special to wear in the location of cancer. The use of static electricity on the cancer cells have a significant effect. The effect of static electricity on cancer cells is prevent the division of cancer cells and destroy them.

1. INTRODUCTION

1.1 Background

Cancer remains a leading cause of death in the world. In 2005, WHO and the World Bank estimates that each year 12 million people worldwide suffer from cancer and 7.6 million of them died. In Indonesia, which is one of the developing countries, cancer is also one health problem that is quite important because the incidence and the number of cancer deaths continues to rise each year. Cancer is the leading cause of death after stroke, tuberculosis, hypertension, injury, perinatal, and DM (Riskesdas, 2007).

The disease is admittedly difficult to cure. Because the cancer that living in the body will continue to undermine the other cells in the body. Medical world generally use chemotherapy to inhibit the growth of cancer cells. However, this method has side effects, such as hair loss, decreased immunity, nausea, and vomiting. Treatment with radiation therapy and chemotherapy need substantial costs. Along with the problems that happen we need a method that can cure the disease with lower risk.

1.2 Problem Formulation

Based on the background above the writer formulate the problems as following:

1. What is cancer?
2. What is static electricity?
3. What is an example of the application of static electricity in the medical field?
4. How does the mechanism of static electricity in cancer treatment?

1.3 Objectives

1. To explain the definition of cancer
2. To explain the definition of static electricity
3. To explain the application of static electricity in the medical field
4. To elaborate the mechanism of static electricity in cancer treatment

1.4 Research Method

In gathering data and get an factual overview of the problem being studied, the writer uses library research methods. The writer gather relevant information from the literature and the internet concerning the problem studied.

2. DISCUSSION

2.1 Cancer

Based on *oxforddictionaries.com* cancer is a disease caused by an uncontrolled division of abnormal cells in a part of the body.

In medical field, cancer is a term used for diseases in which abnormal cells divide without control and are able to invade other tissues. Cancer formed due to uncontrolled gene mutations so that it becomes the body's cells which are unnecessary. Cancer growth may take several months to years. Cancer cells can spread to other parts of the body through the blood and lymph systems.

Cancer is not just one disease but many diseases. There are more than 100 different types of cancer. Most cancers are named for the organ or type of cell in which they start - for example, cancer that begins in the colon is called colon cancer; cancer that begins in melanocytes of the skin is called melanoma.

2.2 Static Electricity

Static electricity is the energy possessed by electrically charged objects. Electric charge can be negative or positive. Static electricity can also be interpreted as electricity does not flow or power electric charges at rest. Static electricity is a form of electricity that is produced when multiple objects rub each other.

Each human cell consists of atoms. Each atom is composed of electrons, protons and neutrons. Protons, neutrons and electrons are very different from each other. They have their own properties, or characteristics. One of these properties is called an electrical charge. Protons have what we call a "positive" (+) charge. Electrons have a "negative" (-) charge. Neutrons have no charge, they are neutral.

2.3 Static Electricity in Medical Field

The use of static electricity in the treatment of cancer has tested by a professor from the Technion Israel Institute of Technology, Yoram Palti, in 2007. Yoram Palti and his team succeeded in proving that the electric field with a frequency of 100 KHz can be used to inhibit the proliferation of cancer cells and destroy cancer cells that are undergoing cleavage by using tumor-treating fields (TTFields).

Subsequently, in 2010, a physicist Warsito Purwo Taruno, develop a static electric wave technology that is claimed to be able to break down the cancer cells without making other cells in the body be damaged .

2.3.1 Novo-TTF-100 A

The NovoTTF-100A System is a portable medical device—in the form of a cap full of electrodes —that delivers low-intensity, intermediate frequency electrical fields that disrupt cell division. These electrical fields, called tumor treating fields (TTFs), can stop

tumor growth by damaging dividing cells. The device “scrambles” cancer cells and prevents them from multiplying, but does not harm healthy cells. It is powered by a 6-pound battery and can be worn for most activities.

The NovoTTF-100A produces alternating electrical fields within the human body that are inferred to disrupt the rapid cell division exhibited by cancer cells, with the alternating electrical fields applied to the brain through electrodes placed on the scalp.

TTFields harness electric fields to arrest the proliferation of tumor cells and to destroy them. The TTField technology takes advantage of the special characteristics and geometrical shape of dividing cells, which make them susceptible to the effects of the alternating electric TTFields. These special fields alter the tumor cell polarity at an intermediate frequency (on the order of 100-300 kHz). The frequency used for a particular treatment is specific to the cell type being treated (e.g., 200kHz for GBM).

2.3.2 ECVT

ECVT (Electrical capacitance volume tomography) scanner system is based on a static electric field that is able to perform a scan of the inside wall to the outside wall. This technology developed by Dr. Warsito Purwo Taruno in 2007. EVCT is an tomography technology. Tomography is a object-scanning technology that allows scanning process without touch the object.

In the medical field, the application of tomography technology, that was introduced in 1972, is still limited to three-dimensional imaging of internal organs. However, this technique achieved significant development since developed by Dr. Warsito. ECVT that invented by Dr. Warsito is able to scan rapid moving objects by generating a 3D image (volumetric).

2.3.2.1 ECCT

After finding ECVT technology, Dr. Warsito developed a new technology for the treatment of cancer by using the principle of ECVT, named ECCT (electrical capacitive cancer therapy). In 2012, ECCT was patented in Indonesia. ECCT is a devices for cancer treatment with static electricity therapy method. The device requires only a

power of 9 volts. The electricity of this device comes from a tool that can re-charge with an electrical device.

Quoted from *forum.detik.com*

> "In the early of research, Warsito make a vest breast cancer. In these vests there are static electric waves. This static electricity can make cancer cells be disintegrate. The vest has been used by her own sister who had breast cancer. Currently, Warsito said, his sister was no longer detectable cancer cells in the her breast. Then, Warsito develop the invention to treat various types of cancer".

In this special-made clothes installed bipolar electrodes placed in the location of the tumor or cancer. The electrodes are powered by the electronic control panel of a small box containing a battery.

When this device be activated, the positive electrode on one side will emit magnetic electrical waves which are then captured the negative electrode on the other side. This emission of electric wave will form the electric field between both of two cathodes. Because it is in between the two poles of the electrodes, the cancer will be affected by the electric field. This electric field will affect cell division chromosome. As a result, the tumor cells do not divide, even destroyed.

2.4 Static Electricity As Cancer Treatment

In her thesis, Musilatun (2010) states that the electric field can inhibit the growth of breast cancer cells. In her experiments, Mursilatun using equipment such as Plate 24-well cell culture as a place to grow cancer cells. This is where the cells that had been grown allowed to grow. She also used Capacitive Electro Therapy to generate an electric field. The electrical current used is an alternating electric current with a voltage range of -8.5 V to +8.5 V. The frequency that can be generated from Capacitive Electro Therapy is 40 KHz, 70 KHz, 100 KHz, and 150 KHz. In her study, the frequency used is 100 KHz. The cells were tested in the experiment conducted by Mursilatun were given electric field for 72 hours continuously.

2.4.1 Electric field in the Human Body

The human body is mostly composed of hydrogen that can be affected by an electric field. The cells in the human body contains electrical dipoles that are like a conductor. Medium conductor has its own peculiarities when an electric field is affected. As we know that the conductors are charges (in this case electrons) are not bound to the atom and can move randomly and freely.

2.4.2 Effect of electric field Against Cancer Cells

The electric field is only affecting when cells are undergoing a division. By the time the cells are dividing, the cells become very sensitive so if any influence or external stimuli, it will affect the process of cell division. The basic principle of therapy using the electric field is that the electric field has an influence on cell division.

Cancer cells are cells with high proliferation rate and uncontrolled division. Active cell that is undergoing division have properties that are very sensitive so that when the electric field is brought to them there was an interaction between cell and the electric field. In the cell, there is a microtubule with a very high electric dipole.

When the cells are dividing given electric field, the electric field is able to penetrate the cell membrane and into the cell. The existence of this electric field, inhibits tubulin dimers pull chromatids toward the poles to cleavage. As a result, the division process is hindered and the number of dividing cells become less.

When a cell is undergoing division, the external electric field can influence the internal electric field so that the electric field lines inside the cell will be more tight. There are two kinds of the influence of the electric field towards the cells that are dividing, i.e. inhibiting proliferation of cancer cells and destroy cells undergoing division.

3. CONCLUSION

The cells in the human body has the electrical properties and also consists of charges with different poles. When there is no influence of external electric field, the charges

scattered randomly. However, when the electric field is brought closer to the cell, then the charges in the cell will be polarized.

If the electric field of alternating current be closed in to a cell, this will lead polarization of the cell also move back and forth. This causes disorder in the cell. This disorder will increase when an electric field with a frequency of 100 KHz brought closer to the cell.

Provision of an electric field to the cancer cells will prevent the division of cancer cells and destroy them. That is because cancer cells be disorder as a result of influence of the electric field.

REFERENCES

Oxforddictionaries.com. [Online]. (http://www.oxforddictionaries.com/definition/english/cancer, accessed 6 December 2014)

Cancer.gov. [Online]. (http://www.cancer.gov/cancertopics/cancerlibrary/what-is-cancer, accessed 6 December 2014)

Accessdata.com. [Online]. (http://www.accessdata.fda.gov/cdrh_docs/pdf10/P100034c.pdf, accessed 6 December 2014)

Mursilatun. (2010). *Pengaruh Medan Listrik terhadap Pertumbuhan Sel Kanker.* [Online]. (http://lib.ui.ac.id/file?file=digital/20181643-S29500-Mursilatun.pdf, accessed 6 December 2014)

Anonymous. (2012). *NovoTTF Therapy Comparable to Chemotherapy for Glioblastoma Multiforme.* [Online]. (http://cancer.unm.edu/2012/05/24/novottf-therapy-comparable-to-chemotherapy-for-glioblastoma-multiforme/, accessed 6 December 2014)

Stupp et. al. (2012). *NovoTTF-100A versus physician's choice chemotherapy in recurrent glioblastoma: "A randomised phase III trial of a novel treatment modality".* [Online]. (http://www.sciencedirect.com/science/article/pii/S0959804912003528, accessed 7 December 2014)

Detik. (2014). *Menghancurkan Sel Kanker Lewat Gelombang Listrik Statis.* [Online]. (http://forum.detik.com/menghancurkan-sel-kanker-lewat-gelombang-listrik-statis-t967278.html, accessed 7 December 2014)

Kabarsehat. (2014). *Menaklukan Kanker Dengan Listrik Statis.* [Online]. (http://www.kabarsehat.com/menaklukkan-kanker-dengan-listrik-statis.html/, accessed 7 December 2014)

Anonymous. (2011). *Terapi Medan Elektrostatik.* [Online]. (http://www.faktailmiah.com/2011/04/15/terapi-medan-elektrostatik.html, accessed 7 December 2014)

Quamila, Ajeng. (2013). *Warsito Klaim 200 Pasien Kanker Sembuh Total dengan Alatnya.* [Online]. (http://www.beritasatu.com/figur/124731-warsito-klaim-200-pasien-kanker-sembuh-total-dengan-alatnya.html, accessed 7 December 2014)