International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 07 | July 2019 www.irjet.net p-ISSN: 2395-0072

A REVIEW PAPER ON CANCER BIOLOGY USING BIOTECNOLOGY AND NANOTECHNOLOGY

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ABSTRACT: This project mainly aims about using of NANOTECNOLOGY to analyze molecular mechanisms of different kinds of cancers. Nanotechnology which includes biotechnology has recently been applied to study various cellular processes, such as cell cycles and cell migration, providing rich spatial and temporal phenotype information. Many opportunities and challenges exist in combining nanotechnology with genomics signal processing techniques to develop more accurate and sensitive biomedical devices for cancer genomics and proteomics to obtain a better understanding of the cellular and molecular mechanisms of different kinds of cancers. **In this article, we present the applications of new nanotechnology treatments using nanoscale that include nanoparticles and devices for genomic signal processing (GSP) in cancer research.**

Key words: Biotecnology,GSP, Nanoparticles, Nanoscale, Nanotechnology.

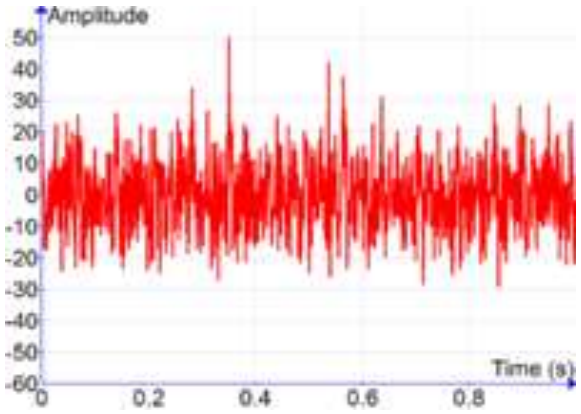
1. INTROUCTION

Cancer, a major cause of death in the United States and throughout the world, accounts for nearly one-quarter of total human mortality. For example, colorectal cancer (CRC) affects approximately 135,000 people and results in 57,000 deaths annually in the United States. Over the past decade, significant discoveries have been made that provide a better understanding of the genetic basis of cancers.. Nanotechnology plays a key role in this vision of the future. Nanotechnology is defined as the functional materials, devices and systems through the control of matter at the scale of 1–100 nm and the exploitation of novel properties at the nanoscale . It is a cross-disciplinary research field between medicine, engineering, and physical sciences, especially involving biochemistry and nanoelectronics. This research field is evolving and offers promising potential for cancer detection and treatment. For example, fluorescent tags are generally too big to enter cells, but the smaller sized nanoparticles (<10 nm) can. These nanoparticles, therefore, can be used to monitor subcellular activities via optical microscopy. Microelectromechanical systems (MEMS) devices are commonly used in GSP for cancer detection. Researchers are currently scaling down MEMS to nanoelectromechanical systems (NEMS), but many microfabrication techniques are re-deployed in NEMS fabrication.

2. GSP

(Genomic Signal Processing)

Genomic Signal Processing is an field of biology which in focus on the analyzing, modifying. It involves the sequencing and analysis of genomes, synthesizing signals such as sound images and biological measurements. The following image shows the analysis of the genomic signals



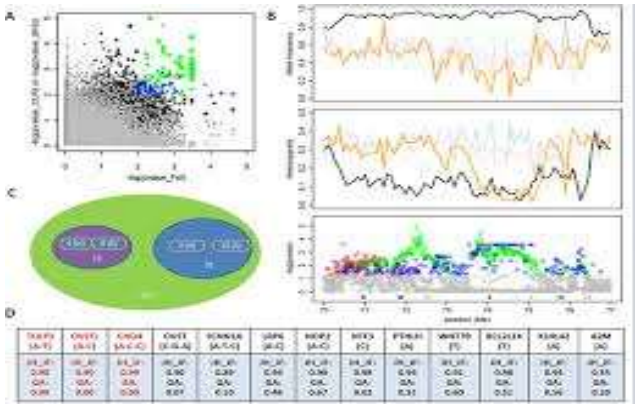
Genomic signals

A number of GSP algorithms, ranging from sequence analysis and statistic methodology in gene selection to modeling genetic regulatory networks and imaging, are presented in this special issue. Our article complements these articles by focusing on the GSP hardware design of the nanotools for cancer research. It provides a qualitative

review of the nanotechnologies involved while the readers can refer to quantitative details from the reference material. In what follows, we introduce biomarker design for cancer labeling, GSP validation, and drug delivery

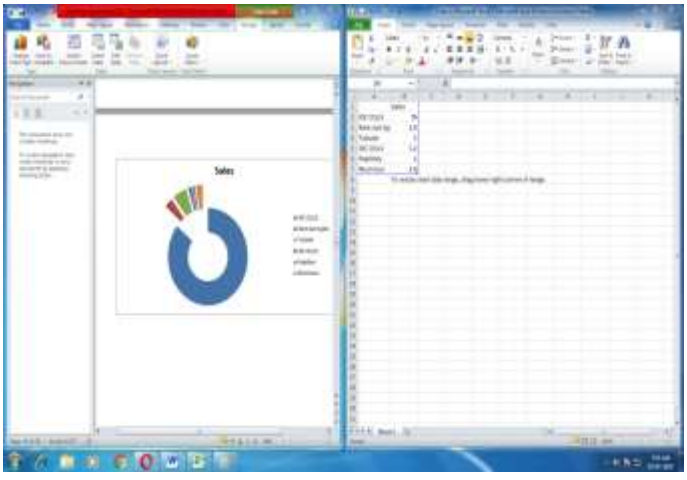
Biomarker: is a measurable indicator of some biological state or condition. Biomarkers are often measured and evaluated to examine normal biological processess pathogenic processes, responses to a therapeutic intervention.

We then describe sensing devices for biomarker detection and DNA and protein sequencing. We also discuss the impact of nanotechnology on GSP and the associated challenges and opportunities. Our goal is to stimulate cross-disciplinary research in combining signal.



Biomarker

The above image shows the biomarker desgin for GSP validation.



Analysis of various cancer cells

The above image shows the analysis of different types of cancer cells.

3.NANOSCALE

Nanoscale technology is a branch of Nanotechnology which comes under biotechnology in which standard size tools are used to manufacture nanometer.

Nanoscale device

The above is the Nanoscale device which uses the nanoscale technology for the analysis of nanoparticles in the cancer research. It is one the devices for genomic signal processing.

Nanoparticles: Nanoparticle is an microscopic particle which is in size between 1 to 100 nanometers.

Nanotechnology treatments for cancer includes various treatments. They are,

- Namoparticle chemotherapy
- Heat therapy
- Radiation
- Miscellaneous

Nanoparticle chemotherapy: There is ongoing research on the use of nanoparticles in chemotherapy. Chemotherapy, which has been used for years to treat cancer, can cause serious damage to the human body. Using nanoparticles, for example, it may be possible to destroy cancer tumors with minimal damage to healthy tissue and without the serious side effects often caused by chemotherapy treatments. Development involves in the area of chemotherapy that produces a tumor-killing agent called tumor necrosis factor alpha (TNF) to cancer tumors. TNF is attached to a particle which is called as nanoparticle along with Thiol-derivatized polyethylene glycol (PEG-THIOL), which helps the TNF to hide in which it bears the

nanoparticle from the immune system. This allows the nanoparticle to flow through the blood stream.

Heat therapy:: One heat therapy to destroy cancer tumors using nanoparticles is called AuroShell. The AuroShell nanoparticles circulate through a patients bloodstream, exiting where the blood vessels are leaking at the site of tumors. Once the nanoparticles accumulate at the tumor the AuroShell nanoparticles are used to concentrate the heat from infrared light to destroy cancer cells without damaging the healthy cells which is surrounded. Nanospectra Biosciences has developed such a treatment using AuroShell that has been approved for a pilot trial with human patients..

Radiation: X-ray therapy may be able to destroy cancer tumors using a nanoparticle called nbtxr3. The nbtxr3 nanoparticles, which is activated by x-rays, generate electrons in the tumor cells that cause the destruction of cancer tumors to which they are to attached themselves. Click here for more details on this method. This is intended to be used in place of radiation therapy which causes less damage to the surrounded healthy tissues. Nanobiotix and The University of Texas MD Anderson Cancer Center are conducting clinical trials for this technique. A method to make radiation therapy more effect in fighting prostate cancer is using radioactive gold nanoparticles attached to a molecule that is attracted to prostate tumor cells. This method will help to concentrate the radioactive nanoparticles at the cancer tumors, allowing treatment to the tumors with minimal damage to the surrounded healthy tissues

Radiotherapy

Miscellaneous:: A method to increase the number of cancer fighting immune cells in cancer tumors is interesting. Nanoparticles containing drug molecules known as interleukins are attached to immune cells (T-cells). The idea is that when the T-cells reach a tumor cells the nanoparticles there present, release the drug molecules, which cause the T-cells to reproduce. T-cells are reproduced in the cancer tumor in sufficient amount the cancer can be destroyed. This method has been tested on laboratory with the mice in which it executed with very good results

CONCLUSION

In this paper, we present nanotechnology treatments that include nanoparticles and devices for genomic signal processing (GSP) in cancer research. GSP has been an active research area over the past decade and aims to integrate signal processing theories and methods with a global and systematic understanding of functional genomics and proteomics. New development in nanotechnology has the potential to make significant contributions to the understanding of cancer biology and the disease management of cancer. Nanotechnology also provides an effective means to facilitate communications between genes and proteins within the living cells and the outside world, thus allowing the detection and treatment of cancers early on.

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