



# NEMS AND ITS APPLICATION IN CANCER TREATMENT

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**ABSTRACT**—At present there are wide varieties of technology, which are vastly being used to analyze biological cells to diagnose diseases and develop methodologies to cure diseases. One such technology is 'Nanotechnology'. Nanotechnology will change the very foundations of cancer diagnosis, treatment, and prevention. Nano scale devices used for the treatment of cancer are based on the constant study of cancer cells and nanotechnology. Nano scale devices which are smaller than 50 nanometers can easily enter the most cells, while those smaller than 20 nanometer can move out of the blood vessels as they circulate through the body. Nanotechnology offers a wealth of tools with new and innovative ways to diagnose and treat cancer. In this paper we design a Nano-device which contains sensors, motor, gene reader, processor, transceiver, and camera and Nano shells. The major source for the destruction of tumor cells was IR (Infra Red) signals and nano-shells. This treatment doesn't involve any critical operations (or) risk factors. This technique will be very well used for the cancer affected people than other technique. *I.e.* chemotherapy & radiation therapy.

**Keyword** : hands off on surgery, Nano shells, IR radiation (1-2) Hz, gene reader.

## 1, INTRODUCTION

The paper deals with the eradication of cancer cells by providing an efficient method of destroying and curing the cancer. This technology focuses on a main idea that the patient should not be affected by cancer again after treatment. In this technology, the healthy cells are not affected in any manner. The purpose of using the IR signal is to save the normal cells.

In general, the most common methods used for the cancer treatment are

- i) Chemotherapy, a treatment with powerful medicines
- ii) Radiation therapy, a treatment given through external high energy rays

## 2, PROBLEM

Both the treatments above mentioned are harmful to human beings. Healthy cells are also destroyed in this process. In these techniques, cancer is cured only for a particular time. To overcome these problems, we make use of nano-technology for the treatment of cancer. In our paper we designed a device which contains sensors, gene reader, and transceiver, motor. The nano-devices are programmed to destroy affected cells and kill only them.



## 2.1 Proposed Solution

The nano devices can be programmed to destroy affected cells and kill only them, thus ending the problem of destroying any formally functioning cells which are essential to one's well being. Thus the treatment using nanotechnology will make the cancer affected person perfectly normal. Nano devices can provide rapid and sensitive detection of cancer-related molecules by enabling the scientist to detect molecular changes even when they occur only in a small percentage of cells.

## 3, NANOSHELLS

Nano shells are used for the destruction of cancer affected cell. Nano shells have a core of silica and a metallic outer layer. These nano shells can be coated with molecules capable of binding specific substrates DNA complementary to a specific gene sequence. The nano shells can be injected safely into the human body through blood vessel. Because of their size, nano shells will preferentially concentrate in cancer lesion sites. These nano shells were designed in such manner that it carries molecular conjugates to the antigens that are expressed on the cancer cells themselves. These nano shells were very carefully programmed that it preferentially links only on the tumor cells.

### NANOSHELLS

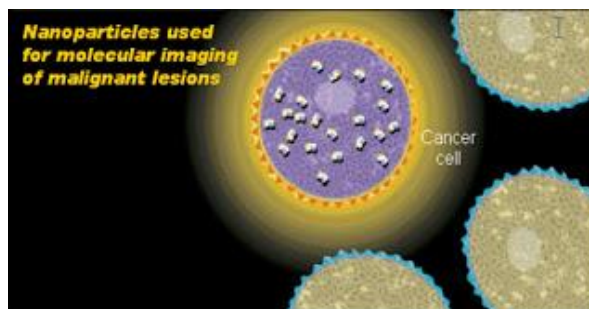


The antibodies and the molecules coated on the nano shells are only attracted by cancer affected cells. Therefore, as the tumor cell secretes the molecular products, the nano shells bind on to the cancer affected cells.

## 4, NANO PARTICLES

Nano scale devices have the potential to radically change cancer therapy for the better and to dramatically increase the number of highly effective therapeutic agents.

In this paper, nano particles are targeted to cancer cells for use in the molecular imaging of a malignant lesion. Large number of nano particles is safely injected into the body and preferentially bind to the cancer cell, defining the anatomical tour of the lesion and making it visible.



These nano particles give us the ability to see cells and molecules that we otherwise cannot detect through conventional imaging. The ability to pick up what happens in the cell-to monitor therapeutic intervention and to see when a cancer cell is mortally wounded or is actually activated- is critical to the successful diagnosis and treatment of the disease.

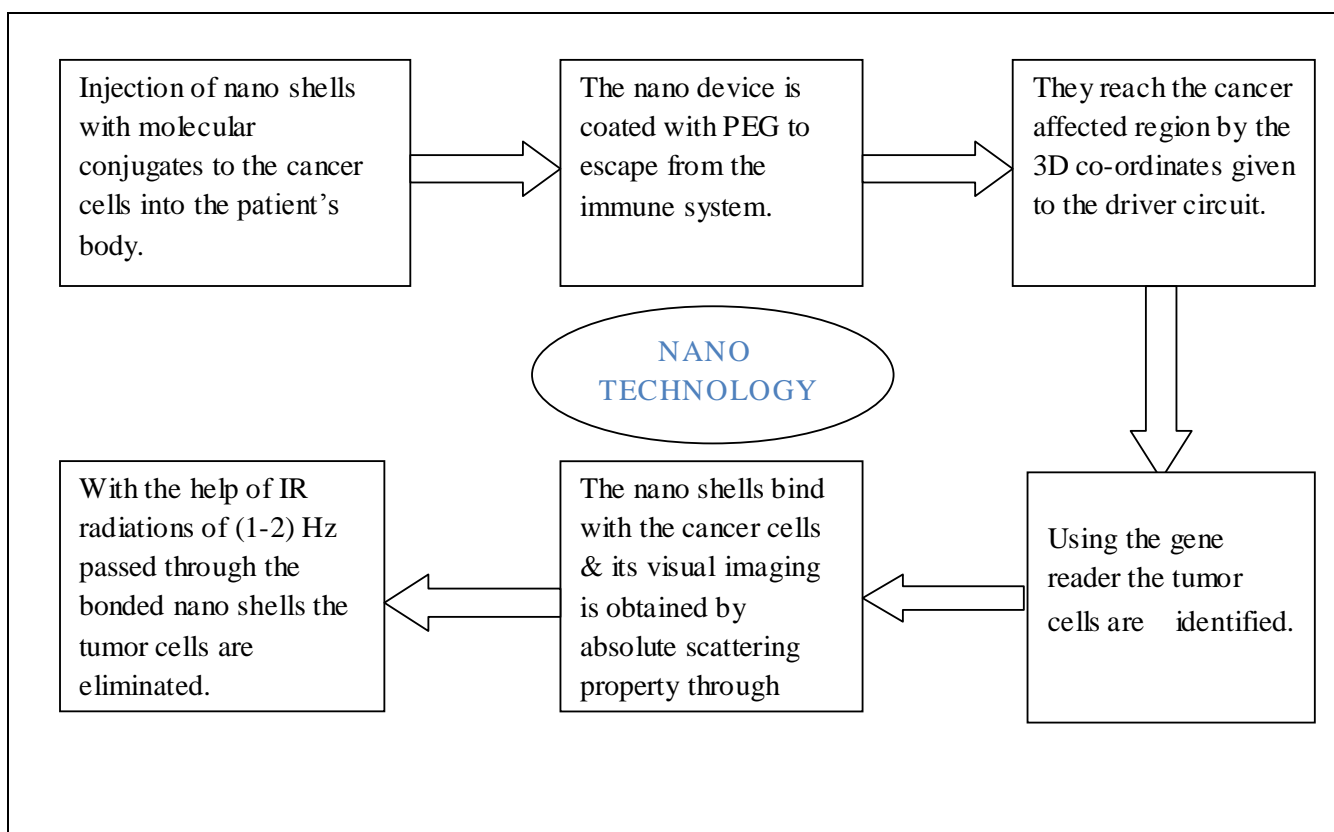
## 5, WORKING PROCEDURE

The initial step of identifying the cancer cells and the location can be done by scanning. Once the location has been identified through scanning, the task is to position the nano device to the exact location. We focus on the positioning of the nano device into the required location by itself. The nano device is allowed to be placed into any part of the body (or) the nano device is injected through the blood vessel. The positioning is done by matching the sample of the tumor cells in the gene reader. External control signals could be used to avoid any mishap or any other errors.

The nano device is loaded with a micro chip. The device is also provided with the compounds concealed so that it is initiated externally through a computer. The nano device contains sensor, motor, gene reader, processor, transceiver, camera and an IR (Infra Red) source. The location of the nano device is imaged and given in the computer screen.



**BLOCK DIAGRAM FOR CANCER TREATMENT USING NANO-TECHNOLOGY**



**6, POSITIONING**

The location of the cancer cell is given as coordinates in a 3-dimensional view. The nano device performs an internal calculation based on the difference between its current position and the reference. Thus the comparisons between current & reference position of the nano-device results in 3-Dimensional orientation of the nano-device and results in exact positioning. Once the positioning is done, we have to move forward to the navigation. (I.e.) locating for more tumor cells.

**7, NAVIGATION**



The output of mathematical operation is given to a driver circuit (motor). The driver helps the device to navigate through the blood with exact direction and speed. The device thus samples its new position and this process continues until the whole tumor cells are bind with nano-shells. The nano-device will move throughout the body and locate all the tumor cells. Very precise control over location of the cancer killer's activities could thus be achieved. The cancer killer could readily be programmed to attack different targets using IR signals while it was in the body. Once the nano-device reached the required spot, the motor is deactivated through external command.

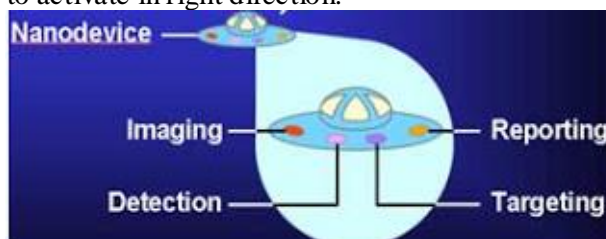
## 8, ALGORITHM FOR NAVIGATION

### 8.1 Steps

- Marking the co-ordinates
- Initialize the command
- Feed the axis
- Send command to emit ultrasound
- Wait for T seconds
- If there is no signal reflected back (or) if the reflected signal is less than the threshold value, then activates the motor to rotate through a certain distance.
- Subtract the axis by one.
- Continue from step 4 to step 7 for both the co-ordinates.
- Once the nano device reaches the required spot, the motor is de-activated through external command
- Receives the IR radiation for T seconds that has been already calculated depending upon the intensity of the tumor.

## 9, IMAGING

Imaging can be done with the help of camera, which is previously bound with the nano-device. It is used to visualize & monitor the internal process. Whenever multiple directions are there in the blood vessel, the device is made to stop through the external control signal and another signal is given to activate in right direction.



Ultrasound scanners form images by transmitting pulses of ultrasonic energy along various beam lines in a scanning plane and detecting and displaying the subsequent echo signals. Our imaging is based on the absolute scattering properties and in the frequency dependence of scattering in tissues, which help to differentiate between normal and abnormal cells.

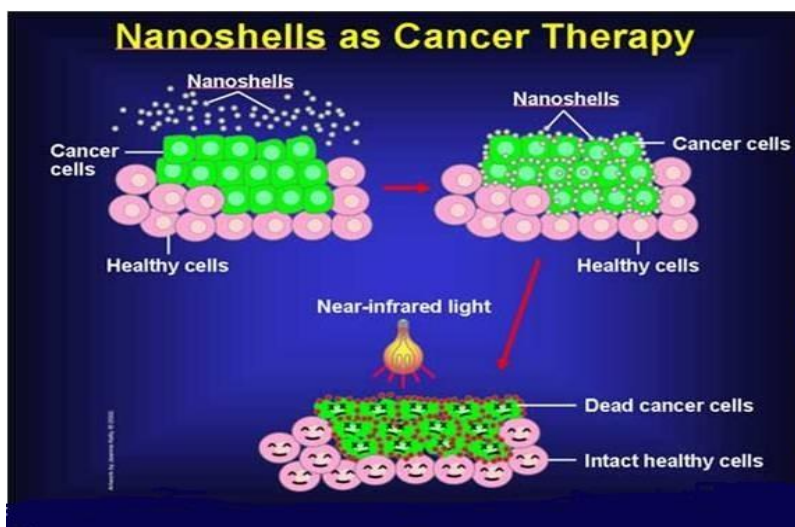


## 9.1 Identification

The nano device identifies the cancer cells using a gene reader. A gene reader is a sensor which contains 10 to 50 DNA probes or samples of cancer cells that are complementary. The DNA detection system generates an electronic signal whenever a DNA match occur or when a virus causing cancer is present. Whenever we get a signal indicating the presence of cancer cells we go for further process. Once the device has located the tumor cells, the next step is the destruction of the cancer cells.

## 9.2 Destruction

The first step in the destruction is that we have to bind the nano-shells on the tumor cells. Nano-shells are present along with the nano-device injected. As the nano-shells are bonded, the **IR** radiation should pass on the tumor cells depending upon the intensity of the tumor. The heat delivery surface transmits IR energy to the cells.



Tumors that have little or no oxygen content also have increased resistance to infrared radiations. Thus due to high resistance to infrared radiations the affected cells get heated and hence destroyed. The IR radiation pulses are transmitted at a frequency of about 1-2 Hz.

## 9.3 How Nano device escapes from immune system?

Generally our immune system attacks all foreign particles entering any part of our body. The problem has been that such nano particles are similar in size to viruses and bacteria, and the body has developed very efficient mechanism to deal with these invaders. It is known that



bacteria with hydrophilic surfaces can avoid being destroyed by immune system and remain circulating in the body for longer periods. To emulate this effect, our nano device can be coated with a polymer such as polyethylene glycol (PEG).

## 10, CONCLUSION

As per our aim we have proposed the implementation of nano-technology and the IR signal for the destruction of cancer cells. This method doesn't affect the healthy cells such that the cancer affected person is healthy after the treatment. This treatment doesn't involve critical operations. This treatment will not take longer time as in any other treatments. Surely one day or other cancer treated patient will be affected again in treatments other than nano-technology. This can be very well used for other dangerous diseases.



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