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A review/survey paper on Nanobots in Medical Applications for brain tumor detections

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Abstract
This study is a review or survey on the use of nanobots in medicine. Designing and creating tiny machines, particularly robotic machines, is the field of nanorobotics. Any "smart" structure that is able to act, sense, signal, process information, think, manipulate, and exhibit swarm behaviour at the nanoscale is a nanorobot (10-9m). More specifically, the term "nanorobotics" (as opposed to "micro robotics") refers to the engineering field of nanotechnology that focuses on designing and creating nanorobots with devices that range in size from 0.1 to 10 micrometres and are made of components that are either nanoscale or molecular. Nanomedicine is one of the first practical applications of nanotechnology. Cancer cells are recognised and eliminated using biological devices. The project shown here was undertaken by an electronics and communication engineering post-graduate student in the department's second year at Bangalore's Dayananda Sagar College of Engineering. It was completed as part of the course requirements.
Keywords : Nanorobot, Medicine, Intelligence.

1. Utilization of Nanobots

An strategy is developed by the author based on many simple molecules that collectively form a robot in place of developing a single complicated molecule to identify various aspects of a cell surface. The first step was to build three different molecular robot components in order to recognise a cell that possesses three distinct surface proteins [1]. Each component was made up of an antibody that was tailored to one of the surface proteins and a piece of double-stranded DNA. The antibody portions of the robot bind to each of these parts and cooperate when they are combined with a group of cells [2]. A robot is operational on cells where all three components are joined, and a fourth component starts a chain reaction among the DNA strands [3]. A DNA strand is exchanged between each component until the last antibody receives a fluorescently labelled DNA strand at the conclusion of the swap [4]. In a sample of human blood, only cells bearing the three surface proteins are labelled with the fluorescent marker at the conclusion of the chain reaction, which takes less than 15 minutes [5].

2. Employment of bots

They employed the DNA computing programme cad nano to assist them construct a folded, 3-D hexagonal DNA nanorobot that can carry molecular "cargo" within its structure for their new

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nanorobot prototype. Two DNA staples on the folded DNA device close around the payload to hold it in place until it reaches the target cells. The cargo can only be delivered when the intended cell's receptors have the proper combination because the molecular locks on the nanorobot are set to react to particular key combinations of proteins on the cell surface [6]. A nano "smart box" is a container that only opens when a key for a lock installed on its lid is detected. This implies that it might be used to deliver medications to cancer cells (and only cancer cells) if it is tuned to proteins on the surface of cancer cells, for example, potentially greatly lowering side effects [7].

3. Conventional cancer therapy treatment modalities

At some time throughout their course of treatment, the majority of cancer patients receive surgery, chemotherapy, radiation therapy, or another conventional therapy; many of them also receive a combination of these therapies. [8] In the traditional procedure, medication injections affect both diseased and non-cancerous cells. Therefore, surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy, and hormone therapy are the main cancer treatment modalities [9].

4. Drawbacks

The standard techniques have a number of negative side effects since they affect both malignant and non-cancerous cells. Surgery and radiation therapy affect both cancer and healthy cells when they remove, kill, or destroy cancer cells in a specific location [10]. The standard approaches, which include surgical procedures and radiation therapy, take longer to heal. When the usual approach is used, some of the adverse effects include fatigue, mouth and throat sores, diarrhoea, constipation, blood abnormalities, and nervous system affects [11].

5. Cancer Treatment Using Nanotechnology

Modern therapeutic methods are required because cancer is the main cause of death. The creation of new nanomaterials and nanocarriers greatly enhances cancer medication delivery [12]. The main goal of using nanocarriers has been to prevent the drug from rapidly degrading after systemic administration and to enable it to reach the tumour at therapeutic concentrations, while minimising drug distribution to normal locations to minimise side effects [13]. These nanocarriers are designed to deliver medications either through passive targeting, which takes advantage of the leaky tumour vasculature, or through active targeting, which makes use of ligands that increase tumour uptake and may increase antitumor efficacy, resulting in a net improvement in therapeutic index [14].

6. Breast cancer diagnosis using support vector machines and wavelet energy

One of the most terrible diseases for women is breast cancer. It is possible to confirm the presence of a range of diseases by watching the patient's symptoms, but the effectiveness and scientific contribution are subpar [15]. The use of computer technology in disease diagnosis has currently become a novel and efficient method due to the spectacular development of machine learning's use in data detection. In this study, breast cancer features were extracted using wavelet energy. A breast cancer prediction model was then developed using the support vector machine's (SVM) data grouping function [16]. The algorithm used to determine the characteristics of the data between benign and malignant tumours did so with accuracy. Therefore, intelligent diagnosis for breast cancer has been shown to be more accurate and reliable than two cutting-edge methods. Using machine learning, predictive analysis, and pattern recognition, it is now possible to diagnose breast cancer with astonishing accuracy and efficiency that much exceeds that of human pathologists [17]. The Wavelet Energy-based Machine Learning techniques were successfully used to the prediction model for breast cancer, however different algorithms have varying degrees of computing efficiency. The figure 1 gives the structural composition of a *n*-bot.

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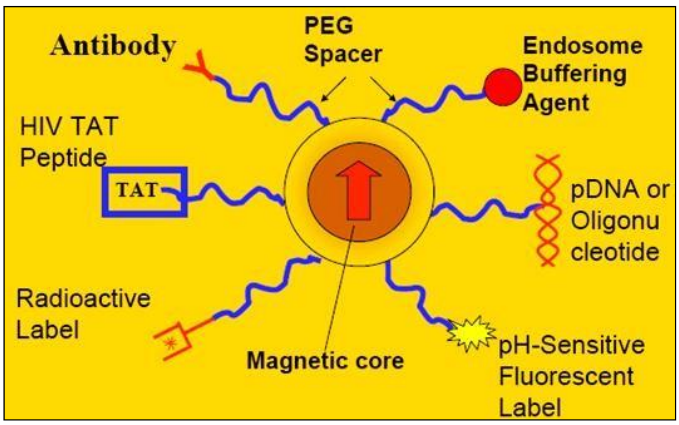

Fig. 1 : Smart nanorobots

7. Utilization of Nanobots

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They employed the DNA computing programme cad nano to assist them construct a folded, 3-D hexagonal DNA nanorobot that can carry molecular "cargo" within its structure for their new nanorobot prototype. Two DNA staples on the folded DNA device close around the payload to hold it in place until it reaches the target cells. The cargo can only be delivered when the intended cell's receptors have the proper combination because the molecular locks on the nanorobot are set to react to particular key combinations of proteins on the cell surface. A nano "smart box" is a container that only opens when a key for a lock installed on its lid is detected. This implies that it might be used to deliver medications to cancer cells (and only cancer cells) if it is tuned to proteins on the surface of cancer cells, for example, potentially greatly lowering side effects.

8. Conclusions

In this article, we have provided a brief overview of the nanorobots that have been applied to biomedical engineering or the treatment of cancer, the most lethal disease in the world. An existing example of molecular nanotechnology is biological systems. Instead of focusing on the distant future, let's start today by developing some genuine working gadgets that will enable us to directly increase our capabilities rather than relying on the byproducts of other technologies to treat some of the deadliest diseases known to man.

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