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Noval Applications of Nanotechnology-A Review

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Abstract: Nanotechnology can be widely used in various fields. The most challenging can be the medical field. As we say the birth of nanomedicine is worth reflecting as it could bring various innovations to healthcare. There are opportunities to design nanosized, bio responsive systems able to diagnose and then deliver drugs and systems able to promote tissue regeneration and repair.Nanorobotics is the technology of creating machines or robots at or close to the microscopic scale of a nanometer (10−9 meters). More specifically, nanorobotics refers to the still largely hypothetical nanotechnology engineering discipline of designing and building nanorobots, devices ranging in size from 0.1-10 micrometers and constructed of nanoscale or molecular components. As no artificial non-biological nanorobots have yet been created, they remain a hypothetical concept. The names nanobots, nanoids, nanites or nanomites have also been used to describe these hypothetical devices.

Keywords: Nanorobot,,drugs, Diagnostic,nanomedicine

1.Introduction

Potential applications for nanorobotics in medicine include early diagnosis and targeted drug delivery for cancer biomedical instrumentation, surgery, monitoring of diabetes and health care. In such cases future medical nanotechnology is expected to employ nanorobots injected into the patient to perform treatment on a cellular level. Such nanorobots intended for use in medicine should be non replicating as replication would needlessly increase device complexity, reduce reliability and interfere with the medical mission.

2.Nanorobots: A Discussion

Nanorobots are theoretical microscopic devices measured on the scale of nanometers (1nm equals one millionth of 1 millimeter). When fully realized from the hypothetical stage they would work at the atomic, molecular and cellular level to perform tasks in both the medical and industrial fields. Nanomedicine's nanorobots are so tiny that they can easily traverse in the human body. Scientists report that the exterior of a nanorobot will likely be constructed of carbon atoms in a diamondoid structure because of its inert properties and strength.

2.1 Nanorobotics Theory

Since nanorobots would be microscopic in size, it would probably be necessary for very large numbers of them to work together to perform microscopic and macroscopic tasks[1]. The typical size of a blood born medical nanorobot will be 0.5-3 micrometers as it is the maximum size that can be permitted due to capillary passage requirement. These nanorobots would be fabricated in nano factories specialized for this purpose. The capacity to design, build and develop large numbers of medical nanorobots into the human body would make possible the rapid elimination of disease and the effective and relatively painless recovery from physical problems. Medical nanorobots can be of great importance in easy and accurate correction of genetic defects and help to ensure a greatly expanded health span.

2.2 Potential Applications

2.2.1 Dentistry

The growing interest in the future of dental applications of nanotechnology is leading to the emergence of a new field called Nano dentistry. Nano robots induce oral analgesia, Desensitize tooth, manipulate the tissue to re-align and straighten irregular set of teeth and to improve durability of teeth. Further it is explained that how nanorobots are

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used to do preventive, restorative, curative procedures[2].

Nanodental techniques involve many tissue engineering procedures for major tooth repair. Mainly nanorobotics manufacture and installation of a biologically autologous whole replacement tooth that includes both mineral and cellular components which leads to complete dentition replacement therapy[7].

2.2.2 Cancer Detection and Treatment

Cancer can be successfully treated with current stages of medical technologies and therapy tools. A decisive factor to determine the chances for a patient with cancer to survive is how earlier it was diagnosed. Therefore a cancer should be detected at least before the metastasis begins. Another important aspect to achieve a successful treatment for patients is the development of efficient targeted drug delivery to decrease the side effects. Considering the properties of nanorobots to navigate as blood borne devices they can help on such extremely important aspects of cancer therapy.

2.2.3 Diagnosis and treatment of diabetes

Glucose carried through the blood stream is important to maintain the human metabolism working healthfully, and its correct level is a key issue in the diagnosis and treatment of diabetes. Intrinsically related to the glucose molecules, the protein hSGLT3 has an important influence in maintaining proper gastrointestinal cholinergic nerve and skeletal muscle function activities and regulating extracellular glucose concentration.The hSGLT3 molecule can serve to define the glucose levels for diabetes patients. The most interesting aspect of this protein is the fact that it serves as a sensor to identify glucose[5]. These nanorobots can be used for the detection of hSGLT3 molecule for proper diagnosis

2.3 Diagnosis and Testing

The testing and monitoring of tissues and blood stream can be fast by using medical nanorobot.. These devices could continuously record and report all vital signs including temperature, pressure, chemical composition and immune system activities from different parts of the body[10]. If a nanorobots swallowed by a patient for diagnostic purposes it can approach to the surface of the stomach lining to begin the search and signs of infection.

3.Disadvantages

Rapid development in the field of nano robotics in the last two decades has generated controversies over the safety of their application as well as the toxic effect of the medical nanorobots on the human being.Besides this its initial design cost is very high and design of the nanorobot is a very complicated . Along this the electrical systems can also create stray fields which may activate bioelectric-based molecular recognition systems in body. Electrical nanorobots are susceptible to electrical interference from external sources such as RF or electric fields, EMP pulses and stray fields.

4.Conclusion

Nanotechnology permits a new understanding and manipulation of the biological processes and materials at the nanoscale (1-100 nm) level.The advantages and applications of nano medicine are high and its benefits are endless but still the safety is a risk factor which is not fully secure. The future of nano medicine can surely increase the human physiology. With various applications of nanotechnology in other fields its utility will surely extend.

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