

## Nanorobotics-A Remodeling Arena of Nanotechnology

Nida Tabassum Khan

Department of Biotechnology, Faculty of Life Sciences and Informatics, Balochistan University of Information Technology Engineering and Management Sciences,(BUITEMS),Quetta, Pakistan

**\*Corresponding Author:** Nida Tabassum Khan, Department of Biotechnology, Faculty of Life Sciences and Informatics, Balochistan University of Information Technology Engineering and Management Sciences,(BUITEMS),Quetta, Pakistan

### ABSTRACT

Nanorobotics is a subdiscipline of nanotechnology that is involved in designing and developing nano devices called as nanorobots. Such engineered nanodevices serve multiple purposes such as being used in biomedical applications for early diseases prognosis, enhancing disease monitoring and treatment. The enduring developments of this field includes molecular sensors, bioelectronics and nano motors etc. Such accomplishments proposes promising future in the field of science.

**Keywords:** Nanobots: Nano swimmers: Meta-materials: Nanorockets: Respiroviruses: Clotting factors.

### INTRODUCTION

Nanorobotics is an emerging subdiscipline of nanotechnology that involves scheming and building of nanorobots which are also termed as nanobots or nanorobots [1]. Nanobots are 0.1-10 micrometres sized devices constructed from nanosized molecular components which allows precise interactions with nanoscale objects [2].

These engineered nano machines are of different types some of are as follows:

#### Nanoengine

Nanoengine fabricated from a single atom by a group of physicists from the University of Mainz in Germany which converts heat energy into motion on a reduced scale [3]

#### DNA Derived 3D-Motion Nanomachines

Nanomachines has been designed and assembled using DNA origami at Ohio State University [4].

#### Nanoswimmers

Designing of an elastic 15 micrometers long nanoswimmer polypyrrole nanowire that is about 200 nanometers in thickness and is capable to pass through biological electrolyte environments [5]. it could be effective in targeted drug delivery to cancerous cells [6].

#### ANTs Nanoengine

- Actuating nanotransducers nanoengines with 100x force per unit-weight [7].

- **Sperm Microrobots:** These are sperm-inspired microrobots, controlled by vacillating weak magnetic fields to be employed in micro-manipulation and targeted therapy tasks [8].
- **Bacteria-Powered Robots:** Bacteria-powered robots guided by an electric field to detect hindrances in their environment [9]. its applications include drug delivery and stem cell manipulation [10].
- **Nanorockets:** High speed remote-controlled nanorocket have been designed by uniting biological molecules with nanoparticles [11].

### APPLICATIONS OF SOME NANOBOTS

Applications of these nanobots are as follows:

- Early recognition of cancer or tumour cells with the help of sensors embedded nanobots will accelerate cancer prognosis [12]. Through explicit programming finding of cancer biomarkers such as e-cadherins and beta-catenin could be easily done [13]. In addition nanobots with surface chemotactic sensors assures targeted specific treatment of cancer [14].
- Nanobots enables target specific delivery of drug or DNA for the treatment of disease [15].
- Producing nanoparticles that assemble in specific tissues and later detected by

magnetic resonance imaging could aid in understanding the anatomy of the infected area [16]

- Nanorobotics could make our existing machines energy proficient utilizing less energy to operate at elevated aptitudes [17].
- Designing novel Meta-materials such as nano sized girders is one of the latest inventions of nanorobotics [18].
- Designing engineered nano respirocites and clottocytes that function as artificial red blood cells to transport oxygen and artificial platelets for halting bleeding respectively [19,20].
- Biosensor embedded nanobots promise enhanced biohazard defenses in remote areas by transferring real-time data in areas where public infrastructure is limited and laboratory facilities are inaccessible [21].
- Nanobots could be helpful in reducing contamination by providing effective screening for seclusion [22].
- Carbon based sponge like nano bots were designed to remove pollutants such as pesticides, pharmaceuticals, fertilizers etc from the oceans and seas [23].
- Nano replicators also called as molecular assemblers were developed to lead biochemical reactions by placing responsive molecules with atomic exactitude [24].
- It is believed that one day nanorobots will establish a communicable interface between our nervous system and the cloud by 2030 [25].
- Cell-like nanobots help clear bacteria and toxins from the blood [26]

However, designing and development of nanorobots is quite a difficult mission with fabrication and control challenges in the way [27]. These challenges could range from engineering nanoscale components to executing medical procedures inside the body under controlled pathways [28].

### CONCLUSION

Nanorobotics is an innovating yet an emerging field that offers immense benefits in the arena of medicine, electronics and information

technology. By designing and developing unique nanobots, this discipline holds the potential to revolutionize the contemporary information analysis routes in a more high tech manner for effective implementation.

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