Review Article

International Journal of Nanotechnology & Nanomedicine

Micro or Nanorobotics In Pharmaceutical Sciences

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Submitted: 02 Jan 2018; **Accepted**: 18 Apr 2018; **Published**: 30 Apr 2018

Miniaturized robotic systems that make use of micro technologies are termed as microrobots. A microrobot may also be defined as one that possesses traits of a robot in the macro world and has some form of reprogrammable behavior and is capable of adapting, the only difference to a macrorobot being the scale at which they are placed. The terms micro robots or micro robotics are also linked to robots that are able to handle objects and carry operations at the micrometer range [1].

The field of microrobotics combines aspects of wireless navigation, control, material science, microfabrication, medicine and biology to produce wireless millimeter and submillimeter-sized platforms for targeted therapies. Microrobots have the potential to navigate through bodily fluids and enable basic multiple functions such as sensing, drug delivery and physical support for cells and tissues in parts of the body that are currently inaccessible or too invasive to access . The efficacy of the treatments will significantly improve by accurately positioning the devices near the target position, without the need of invasive surgical treatments, and with a sutureless injection. Precise actuation methods, either externally driven by electromagnetic fields, or exploiting physiological triggers (like local acidosis associated with pathological scenarios , or temperature gradients related to inflamed sites) would upgrade these systems to a level of intelligence higher than the current commercial products [2].

Many researches on microrobots have carried out a lot of various actuation methods for microrobots, such as electromagnetic actuators , chemical bubble actuators , swimming tail actuators,bacterial actuators, and so on. Especially, the electromagnetic driving method has many advantages. First, electromagnetic field can be used to drive the microrobot with high controllability through changing the currents of the electromagnetic coils. Second, magnetic field will not cause harm or side effects to humans. Among the researches of magnetic controlled microrobots, Bradley J. Nelson's group, inspired by the natural design of bacterial flagella, proposed an artificial bacterial flagella microrobot that could swim in a controllable fashion using weak applied magnetic fields [3].

Fields Of Application [4]

- To cure skin diseases, a cream containing nanorobots may be used. It could remove the right .amount of dead skin, remove excess oils, add missing oils, apply the right amounts of natural moisturizing compounds, and even achieve the elusive goal of 'deep pore cleaning' .
- A mouthwash full of smart nanomachines could identify and destroy pathogenic bacteria while allowing the harmless flora of the mouth to flourish in a healthy ecosystem.
- Medical nanodevices could augment the immune system by finding and disabling unwanted bacteria and viruses.
- Fighting cancer: Doctors hope to use nanorobots to treat cancer patients. The robots could either attack tumors directly using lasers, microwaves or ultrasonic signals or they could be part of a chemotherapy treatment, delivering medication directly to the cancer.
- Parasite Removal: Nano or micro robots could wage micro-war on bacteria and small parasitic organisms inside a patient.
- Cleaning wounds: Nanorobots could help remove debris from wounds, decreasing the likelihood of infection. They would be particularly useful in cases of puncture wounds, where it might be difficult to treat using more conventional methods.

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