Nanoactuators Based FePd Nanohelices to Initiate Cell Apoptosis

This technology offers a nan-actuator to initiate apoptosis and the removal of cancer cells. The nano-actuators magnetically is propelled to target cells and oscillate for mechanical damage of the cells.

What is the Problem?

The targeting and removal or destruction of malignant cells in a body is an ongoing battle in the war against cancer. Many existing treatment methods can lead to unwanted collateral health effects, partly due to resultant cell necrosis. Necrosis occurs, for example, when a cell is sufficiently damaged by an external factor, such as poison, a bodily injury, or an infection. When cells die from necrosis, it may cause inflammation that can cause further damage to the body. Alternatively, if a cell sustains irreparable internal damage the cell will initiate apoptosis. In particular, a damaging mechanical disruption to a cell can induce the cell to initiate apoptosis. It would be beneficial if malignant cells in a body could be targeted and selectively mechanically agitated to induce damage sufficient to cause the target cell to initiate programmed cell death without rendering the cells necrotic.

What is the Solution?

The solutions are nano-actuators and methods used to initiate such apoptosis to remove cancer cells. The nano-actuators include a ferromagnetic head and a compliant helical portion extending from the head formed in part from a ferromagnetic shape memory alloy. This is configured to be elastically compressible with an external magnetic field, and to expand when the magnetic field is removed. A thin biocompatible external layer provides a platform for attaching a ligand that is selected to bind with a target cell type, for example, a target cancer cell. The nano-actuators are magnetically propelled to the target cells and oscillated to mechanically damage the target cells to induce apoptosis.

What Differentiates it from Solutions Available Today?

As an option to the surgical removal of malignant cells, modern medical advances have developed treatments, such as chemical and radiation treatments, that are designed to induce in situ programmed cell death in malignant cells. These approaches introduce unwanted collateral health effects. This solution provides a treatment that does not require irradiation or poisoning of the body (or reduces the amount of irradiation or poisoning) thereby avoiding or mitigating unwanted collateral health effects that may be caused by such treatments, improving patient outcomes and quality of care.

Technology ID

BDP 8687

Category

Selection of Available Technologies

Therapeutics/Other

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Patent Information:

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References

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