Nanomedicine & Biotherapeutic Discovery

Extended Abstract

Combined therapeutic medical device and stem cells for regenerative nanomedicine

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Abstract

In our group we explore a new generation of smart living implants combining not only active therapeutic but also stem cells, as a novel strategy to regenerate stabilized cartilage and avoid prosthesis by achieving regeneration of its sub-chondral bone foundation, requirement which is failing today in the clinic. In our group, a unique nanotechnology strategy is used to entrap, protect and stabilize therapeutic agents into polymer coatings: Nano-reservoirs, covering nano-fibers of implantable nanofibrous membranes for bone and cartilage regeneration. Upon contact with cells, therapeutic agents become available through enzymatic degradation of the nano-reservoirs. As cells grow, divide and infiltrate deeper into the porous membrane, they trigger slow and progressive release of therapeutic agents that, in turn, stimulate further cell proliferation. The nano-reservoirs technology enables to reduce the quantities of required therapeutic agent (compared to soaked membranes for instance) thereby reducing costs. Feasibility and safety assessment of a therapeutic implant based on an active polymeric wound dressing and autologous mesenchymal stem cells derived from bone marrow for the treatment of femoral cartilage isolated lesions.

Regenerative medication deals with the "process of exchange, engineering or create human or animal cells, tissues or organs to revive or establish traditional function". This field holds the promise of engineering broken tissues and organs by stimulating the body's own repair mechanisms to functionally heal antecedently irreparable tissues or organs. Regenerative medication conjointly includes the chance of growing tissues and organs within the laboratory and implanting them once the body cannot heal itself. once the cell supply for a regenerated organ comes from the patient's own tissue or cells, the challenge of surgical process rejection via immunologic couple is circumvented. This approach may alleviate the matter of the shortage of organs obtainable for donation. a number of the medical specialty approaches at intervals the sector of regenerative medication might involve the utilization of stem cells. the injection of stem cells or ancestor cells obtained through directed differentiation (cell therapies); the induction of regeneration by biologically active molecules administered alone or as a secretion by infused cells (immunomodulation therapy); and transplantation of in vitro adult organs and tissues (tissue engineering). Widespread interest and funding for analysis on regenerative medication has prompted establishments within the u. s. and round the world to determine departments and analysis institutes that focus on regenerative medication including: The Department of Rehabilitation and Regenerative medication at Columbia, the Institute for somatic cell Biology and Regenerative medication at Stanford University, the middle for Regenerative and Nanomedicine at Northwestern University, the Wake Forest Institute for Regenerative medication, and also the British Heart Foundation Centers of Regenerative medication at the University of Oxford. A medical device is any device supposed to be used for medical functions. Medical devices profit patients by serving to health care suppliers diagnose and treat patients and serving to patients overcome illness or unwellness, rising their quality of life. important potential for hazards are inherent once employing a device for medical functions and therefore medical devices should be well-tried safe and effective with cheap assurance before regulation governments permit promoting of the device in their country. As a general rule, because the associated risk of the device will increase the quantity of testing needed to determine safety and effectiveness conjointly will increase. Further, as associated risk will increase the potential profit to the patient should conjointly increase. within the u. s. it wasn't till the Federal Food, Drug, and Cosmetic Act (FD&C Act) in 1938 that medical devices were regulated. Later in 1976, the Medical Device Amendments to the FD&C Act established

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medical device regulation and oversight as we all know it nowadays within the u. s.. a world definition for medical device is tough to determine as a result of there are various restrictive bodies worldwide overseeing the promoting of medical devices. though these bodies typically collaborate and discuss the definition normally, there are delicate variations in formulation that stop a world harmonization of the definition of a medical device, therefore the suitable definition of a medical device depends on the region. typically a little of the definition of a medical device is meant to differentiate between medical devices and medicines, because the restrictive needs of the 2 are totally different. Definitions conjointly typically acknowledge In vitro nosology as a taxonomic category of medical devices and establish accessories as medical devices. Medical devices vary in each their supposed use and indications to be used. Examples vary from easy, low-risk devices like tongue depressors, medical thermometers, disposable gloves, and bedpans to complicated, bad devices that are ingrained and sustain life. One example of bad devices are those with embedded software system like pacemakers, and that assist within the conduct of medical testing, implants, and prostheses. the look of medical devices constitutes a significant phase of the sector of medical specialty engineering. living thing matrix materials are commercially obtainable and are utilized in plastic surgery, treatment of chronic wounds, and a few medical science surgeries; as of January 2017 clinical studies were underneath thanks to use them in operation to do to repair broken heart tissue.

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