

Tunable Control of Therapeutics Release from the Nanochannel Delivery System (nDS)

Authors : Thomas Geninatti, Bruno Giacomo, Alessandro Grattoni

Abstract : Nanofluidic devices have been investigated for over a decade as promising platforms for the controlled release of therapeutics. The nanochannel drug delivery system (nDS), a membrane fabricated with high precision silicon techniques, capable of zero-order release of drugs by exploiting diffusion transport at the nanoscale originated from the interactions between molecules with nanochannel surfaces, showed the flexibility of the sustained release in vitro and in vivo, over periods of time ranging from weeks to months. To improve the implantable bio nanotechnology, in order to create a system that possesses the key features for achieve the suitable release of therapeutics, the next generation of nDS has been created. Platinum electrodes are integrated by e-beam deposition onto both surfaces of the membrane allowing low voltage (<2 V) and active temporal control of drug release through modulation of electrostatic potentials at the inlet and outlet of the membrane's fluidic channels. Hence, a tunable administration of drugs is ensured from the nanochannel drug delivery system. The membrane will be incorporated into a peek implantable capsule, which will include drug reservoir, control hardware and RF system to allow suitable therapeutic regimens in real-time. Therefore, this new nanotechnology offers tremendous potential solutions to manage chronic disease such as cancer, heart disease, circadian dysfunction, pain and stress.

Keywords : nanochannel membrane, drug delivery, tunable release, personalized administration, nanoscale transport, biomems

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