Alessandro Grattoni, J Pharm Drug Deliv Res 2015, 3:3
http://dx.doi.org/10.4172/2325-9604.S1.002

OMICS International
conferenceseries.com SciTechnol

World Drug Delivery Summit

August 17-19, 2015 Houston, USA

Silicon nanochannel platforms for tightly controlled therapeutic release and immunoisolated cell transplantation

Alessandro Grattoni
Houston Methodist Research Institute, USA

Silicon nanochannel platforms leveraging nano-constrained diffusion for tightly controlled therapeutic release and immunoisolated cell transplantation: Through cutting-edge implementation of fabrication techniques developed in the microelectronics industry, our group is able to create dense arrays of nanochannels ranging from nanometers to millimeters in height with a precision of ±10%. Two device platforms have been invented in order to leverage these capabilities: a silicon nanochannel membrane for drug delivery and a surface-modified polymer system for cell transplantation. The drug delivery system employs adaptable channel sizes down to 2.5 nm to closely constrain molecular transport, linearizing Fickian diffusion to achieve constant administration. Implantable drug delivery devices are fashioned by integrating these nanochannel membranes within bioinert metallic or polymeric capsules. These devices are minimally-invasive, can be implanted subcutaneously, and provide linear (zero-order) release of drugs and biomolecules. Clinically-relevant dosages of testosterone for hormone replacement have been released for more than 6 months at a constant rate with this platform. Further innovations include active, on-board control systems to permit remote manipulation or activation, enabling telemedicine or chronotherapy regimens. The polymeric cell transplantation system was primarily developed for pancreatic islet allografts. This device, the "NanoGland", is used to provide an immunoprotective environment for bioactive allografts by isolating cells from inflammation and rejection mechanisms while permitting interaction with glucose, insulin, nutrients, and waste exchange from the interstitial environment. Combining the NanoGland with the silicon nanochannel membranes has allowed controlled release of immunosuppressive material or factors for cell growth and vascularization following cell transplantation.

Biography

Alessandro Grattoni obtained his PhD in Biomedical Engineering at Politecnico of Torino while working in Dr. Mauro Ferrari's team at the University of Texas Health Science Center in Houston. He is an Assistant Professor and Chair of the Nanomedicine Department at HMRI. His laboratory's research focuses on the development and validation of nanochannel membranes for long-term administration of therapeutics and cell transplantation. This includes experimental and phenomenological analyses within both *in vitro* and *in vivo* models. He has received support from NASA, NIH, CASIS, Vivian Smith Foundation, Nancy Owens Memorial Foundation, and NanoMedical Systems, Inc.

agrattoni@houstonmethodist.org

Notes: