Meetings International SciTechnol

Guillaume Tresset, J Pharm Sci Emerg Drugs 2018, Volume: 6
DOI: 10.4172/2380-9477-C6-020

INTERNATIONAL MICROFLUIDICS CONGRESS
&
International Conference on
ADDICTION RESEARCH AND THERAPY

August 13-14, 2018
San Diego, USA

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Microfluidics-directed self-assembly of DNA-based nanoparticles

The 'bottom-up' paradigm of nanofabrication mostly relies on molecular self-assembly, a process by which individual components spontaneously form ordered structures with emerging functions. Soft nanoparticles made up of therapeutic DNA condensed by cationic lipids or surfactants hold a great potential for nonviral gene delivery. Their self-assembly is driven by strong electrostatic interactions. As a consequence, nanoparticles formulated in bulk often exhibit broad size distributions not suitable for practical delivery applications. We will review the recent strategies we developed to control the self-assembly kinetics by using microfluidic devices. This combined approach may open attractive opportunities for the directed self-assembly of complex soft nanomaterials in particular for biomedical purposes.

Biography

Guillaume Tresset received his master in electrical engineering from the Ecole Superieure dElectricite (Supelec) and obtained his PhD in physics at the French Atomic Energy Agency (CEA). He worked at the University of Tokyo on microfluidic devices, then at the Institute of Bioengineering and Nanotechnology in Singapore on artificial viruses for gene delivery purpose. He is now research scientist with the French National Center for Scientific Research (CNRS) in Orsay. He is an expert in the physics of self-organizing biological matter and he develops microfluidics-based strategies for the controlled assembly of soft nanostructured particles. He is an author of about 90 communications in journal articles and conference proceedings, and he filed 2 patents for nanobiotechnological applications.

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