Nanomedicine evolution and perspective

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Since the first formulation of liposomes in the 1960s, nanomedicines (NMeds) have been at the forefront of innovative strategies for therapeutic and diagnostic application for overcoming the limitations of free drugs. Advances such as increased bioavailability, decreased off-target toxicity, improved biodistribution, protection of sensitive molecules, and penetration into hard-to-reach organs such as the brain, have led to several marketed NMed-based products for cancer therapy, e.g. Doxil® and Abraxane®, and the more recent Covid-19 vaccine Comirnaty® by Pfizer-Biontech. Notwithstanding the increase in pharmaceutical potential and popularity as drug delivery systems, we are coming to an impasse as to the number of NMeds being considered for clinical trials due to difficulties in the design, characterization, scalability, and biological fate of the NMeds. This leads to the question: What is the future for NMed research? This talk will focus on where we are in the research in nanomedicine focusing on the necessity to improve the understanding of 1) CHARACTERIZATION AND REGULATORY ASPECTS, 2) MICROFLUIDIC PRODUCTION, 3) NMed BIOLOGICAL FATE, and 4) DEPOT SYSTEMS in order to continue advancing the field to produce reliable and marketable drug delivery systems.