

18th ANNUAL PHARMA MIDDLE EAST CONGRESS

November 05-07, 2018 Abu Dhabi, UAE

Multifunctional nanoparticles for cancer immunotherapy: An emerging approach for personalized cancer therapy

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Several cancer immunotherapeutic approaches have been recently introduced into the clinics and they have shown remarkable therapeutic potentials. The groundbreaking cancer immunotherapeutic agents function as a stimulant or modulator of the body immune system to fight against or treat cancers. Although targeted immunotherapies such as immune check point inhibitors (CTLA-4 or PD-1/PD-L1), DNA vaccination and CAR-T therapy are revolutionizing cancer treatment, the delivery efficacy can be further improved while their off-target toxicity can be mitigated through nanotechnology approaches. Nanomedicines can be multifunctional drug delivery agents for cancer therapies. However, they have faced several challenges in clinical trials owing to poor targeting ability, insufficient tumor penetration, difficulty in synthesis and scale up and limited understanding of interactions between a tumor and nanoparticles. In this regard, tumor multicomponent targeting drug delivery systems are a rational approach for developing tumor-site-specific therapeutics. The nanoparticles can be co-loaded with drugs, genes and imaging agents, surface decorated with varying targeting ligands that can home to varying tumors and/or tumor multicomponent. Recent research has demonstrated that nanotechnology has multifaceted role for (1) re-educating Tumor Associated Macrophages (TAM) to function as tumor suppressor agent, (2) serving as an efficient alternative for Chimeric Antigen Receptor (CAR)-T cell generation and transduction and (3) selective knockdown of KRAS oncogene addiction by nano-Crisper-Cas9 delivery system. The function of host immune stimulatory signals and tumor immunotherapies can further be improved by repurposing of nanomedicine platform. This presentation will summarize the role of multifunctional polymeric, lipid, metallic and cell-based nanoparticles for improving current immunotherapy.

Biography

Hashem Alsaab has completed his PhD from Dr. Iyer's group in U-BiND Systems Laboratory, Department of Pharmaceutical Sciences, EACPHS Wayne State University, USA and Pharmacy (PharmD) and Master of Science in Pharmaceutical Sciences-Industrial Pharmacy option from University of Toledo, OH, USA. He is currently working as an Assistant Professor of Pharmaceutics and Pharmaceutical Technology, Taif University, Saudi Arabia. He is a Research Scientist with a demonstrated history of working in the higher education and clinical practice. He is skilled in pharmaceutical sciences, cancer research, drug delivery, nanotechnology and biotechnology.

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