



## NanoDDS 2018: Engineering the next wave of nanomedicine and drug delivery systems

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The 16<sup>th</sup> International Drug Delivery and Nanomedicine Symposium was held between Sep 21–23<sup>rd</sup> in Portland, Oregon. This conference was Chaired by Prof. (s) Gaurav Sahay, Conroy Sun, Oleh Taratula, Adam Alani and Olena Taratula. 25 invited speakers were invited in the area of nanomedicine, including scientific luminaries, young investigators, and academic and industrial scientists. The program spanned six sessions with broad areas in cancer nanotechnology, nucleic acid delivery, tissue engineering and precision medicine. Two panel discussions were held on the past, present and future of nanomedicine and careers in science. We received over 110 posters from around the world and approximately 200 people participated in the program. To further provide a platform for young investigators, we selected six late breaking topics and gave six poster awards with the opportunity to give talks. The poster award winners were Tzu-Chieh Ho (Columbia University), Jillian Perry (UNC), Duhyeong Hwang (UNC), Michael Dunn (Univ of Toronto), Siddharth Patel (OSU) and Meilyn Sylvestre (Univ of Washington). We additionally, provided six travel awards for students and trainees. We have created this issue by inviting speakers and chairs of the conference to provide insights over topical areas in the field of nanomedicine, drug delivery and tissue engineering.

This issue begins with reviews focused on cancer nanomedicine which remains a widely researched area in this field. **Andrew Wang** provide insights on advancing nanoparticle-based systems that can enable cancer immunotherapies and unleash their potential in clinical setting. **Adam Alani and Glen Kwon** provide an overview on the role of lymphatics on cancer and summarize methods to target cancer populations in the lymph and enhance drug delivery into the lymphatic system. **Conroy Sun** highlights the importance of combining nanotechnology with radiation medicine. They provide a survey of fundamental studies in radiotherapy, cancer biology and summarize its integration with nanotechnology that can propel breakthroughs in cancer treatment.

The next articles provide insights into the development of nanomedicine for targeting and imaging of selective cell populations and detail fundamental mechanisms of intracellular delivery and evaluate toxicity of nanomaterials. **Tamara Minko and Oleh Taratula** summarize major advantages and limitations of organic, inorganic and living-cell based drugs and the methods being pursued for engineering more selectively targeted nanotherapeutics. **Jesse Jokerst** offers an

overview of recent developments in theranostics, real time drug monitoring and stem cell tracking using photoacoustic and discusses on challenges facing this area. **Gaurav Sahay** and **Alexander Kabanov** provide a brief update on mechanisms of intracellular trafficking of nanoparticles and suggest a roadmap to study endocytosis of nanomedicines *in vivo* with subcellular precision. **Hamid Ghandehari** and coworkers present a detailed review of long-term toxicity of inorganic nanoparticles and provide an assessment on subchronic and chronic toxicity of such materials for delivery applications. A critical analysis of factors like material composition, physicochemical properties and pharmacokinetic parameters that can be used to determine long-term toxicology of inorganic nanoparticles is provided.

Next set of articles move beyond traditional drug delivery approaches and applications. **Yizhou Dong, Daniel Siegwart and Daniel Anderson** review the area of RNAi therapeutics. This area has had a lot of excitement due to the first FDA approval for siRNA drugs, which use synthetic nanoparticles as an enabling technology for their successful delivery. The review provides a chemical perspective behind siRNA synthesis, siRNA conjugates, and nanoparticle delivery systems being pursued for effective delivery with minimal off-targeting effects. **Omid Veiseh and Arturo Vegas** provide a perspective on recent advances in materials development and device design to overcome immune-mediated reaction that emanate from implanted devices. They provide a survey of biomedical applications that are being enabled with emergence of such materials like cell-based therapies. **Ali Khademhosseini** provides a comprehensive review on electrically conductive nanomaterials to the development of scaffolds for cardiac tissue engineering and effects of nanomaterials on proliferation, migration and cardiomyogenic differentiation. These approaches are being pursued to develop scaffolds that can repair cardiac tissue in the damaged heart.

Finally, NanoDDS has always centered on fostering growth of next generation of students/postdocs and young faculty. NanoDDS remains very special for this editor since this was the first conference I attended as a graduate student, and now had the privilege to organize. Therefore, we conclude this issue by an important perspective by **Elizabeth Nance** on the field of nanomedicine, and career trajectories available for young scientists and the role of mentors to provide diverse training to allow next generation scientists to seek new directions.

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