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The drug delivery (r)evolution: Nanomedicine and 3D printing for personalized therapies

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One of the main goals of nanomedicine is the design and development of "smart" drug delivery systems: nanostructures that can simultaneously diagnose and release bioactive molecules under spatio-temporal control. To that end, the multifunctional drug delivery platforms must display unique properties but also require sophisticated chemical approaches to build them. Although their fascinating molecular engineering has substantially enriched the literature, they could be quite far to reach the market. What is needed? Besides the construction of platforms with more functionality, is fundamental to keep in mind those key aspects that can make the nanostructures succeed. On the other hand, the way the systems will be fabricated and scaled-up should not be neglected. One of the most outstanding fabrication techniques is 3D printing. The integration of nanomedicine and 3D printing has opened the door to a vast number of opportunities for manufacturing nanomaterials-based micro and macrosale biomedical devices. In this context, the research is mainly focused on the design of novel inks comprised by smart materials, nanocomposites and even living cells. Certainly, innovative inks are needed, but are they enough? Thus, in this work, we present our approaches to answer the stated questions. Regarding the drug delivery platforms, our approach is the systematic design of nanosystems by studying every single gear of the nanoassembly in terms of their interactions at the biological interfaces, and the physicochemical evaluation of their disassembly when they reach the biological target. With respect to the 3D printing technologies, we are focused on the relationships between the manufacturing parameters/processes and the physicochemical requirements of the actual nanomaterials for being printed. In this way, we intend to join two revolutionary directions in drug delivery, not for creating a super revolution but to be part of the evolution of the pharmaceutical and biomedical fields.

Biography

Yareli Rojas-Aguirre got her PhD degree in Chemistry in 2013 from the National Autonomous University of Mexico. In the same year, she joined the Biomedical Engineering Department at the University of Michigan as a Post-doctoral fellow. In 2014, she came back to Mexico to start her career as young Professor at the National Autonomous University of Mexico. Her research interests focus on the design and synthesis of biomaterials and the study of their interactions at biological interfaces to: Rational design and develop advanced drug delivery systems; investigate at the micro and macro scale biomaterials fabrication processes, in particular 3D printing (additive manufacturing) for biomedical devices; integrate the biomaterials and biofabrication research with the discovery of new bioactive molecules and/or drug repositioning approaches to accomplish drug delivery platforms that lead up to novel and suitable therapies.

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