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Envisioning the Future of Nanotechnology Platforms for Biomedicine

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Nanomedicine is one of the most promising areas in science and technology, leading to the convergence of nanotechnology and medicine towards improved diagnostic and therapeutic strategies that take advantage of the unique properties of materials at the nanoscale. Rapid developments in this field are taking place in terms of both our scientific understanding of applied nanoscience as well as the engineering design of programmable nanotechnology platforms with tunable and desirable features. While the earliest accomplishments in nanomedicine principally focused on cancer medicine, there has been a recent explosion on new frontiers of clinical application, including neuroscience and infectious diseases. Shifting beyond classical examples of nanomedicines, we are also witnessing a greater diversity in relevant topics and applications as the lines between nanotechnology and medicine blur and lead to new innovations: platform technologies which redefine our vision of what nanomedicine is and what it can become.

In order to capture the diversity of worldwide research activities taking place towards this goal, this special issue of *Small* was created and organized around the topic "Nanotechnology Platforms for Biomedicine". We are delighted that many of the top research groups in the world have decided to join us in this effort, leading to the publication of a collection of seminal works that includes one review article, one concept paper, five communications, and seven full papers. The research findings reported in the articles enclosed herein cover cutting-edge advances in nanotechnology platforms for biomedicine, including drug and gene delivery systems, neural technologies, molecular modeling tools, biosensors and diagnostics, and theranostics. Here, we provide an overview of a few major themes presented in this issue.

Numerous advantages in gene and drug delivery are reported, including controllable platforms based on DNA nanotechnology and two-dimensional materials. Sustainable delivery vehicles based on natural pollen materials are also presented along with macromolecular strategies to optimize the therapeutic properties of lipid-based nanomedicine carriers. There are also important advances in medical technologies with significant clinical implications. Microfabrication and patterning strategies based on controlling cell behavior are communicated, along with theranostic tools for brain cancer, nanomedicine strategies to blunt virus infections, and cell phone-based devices for blood analysis. The behavior of nanoparticles in biological fluids, including membrane interactions and compositional identity, are also studied and biosensors for antiviral drug evaluation and protein recognition are described. Altogether, we hope that these works will stimulate the development of innovative solutions to key challenges in human health and medicine, including improvements in therapeutics, diagnostics, and regenerative medicine.

In closing, we would like to express our warmest gratitude to the editorial team of *Small*, especially Dr. José Oliveira, Dr. Jovia Jiang, and Dr. Lisa Smith. From concept to production, the team has played an instrumental role in creating this special issue and we are sincerely indebted to their first-rate professionalism and editorial vision. We would also like to express thanks to our friends and colleagues who have chosen to participate in the special issue and present cutting-edge research findings on nanotechnology platforms for biomedicine. We could not have achieved the successful production of this special issue without all of your efforts, and I hope that the work presented in this issue inspires researchers from across a wide range of scientific disciplines to continue developing nanotechnology platforms that hold great potential to improve human health and medicine.

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