International Journal of Nanomedicine

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EDITORIAL

Today's diverse nano-theranostic applications and tomorrow's promises

This article was published in the following Dove Press journal:
International Journal of Nanomedicine
25 August 2015
Number of times this article has been viewed

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In 2004, the US Food and Drug Administration (FDA) released an important report entitled Innovation/Stagnation: Challenges and Opportunities on the Critical Path to New Medical Products.[1] In this report, the FDA strongly expressed its interest in modernizing manufacturing processes (or scientific tools) for medical products. Theranostics was indicated as one of the best candidates that can epochally change such scientific tools toward a critical path to new medical products. Since the concept was first introduced in 1998 by John Finkhouser, theranostics has been generally considered as combining therapy and diagnosis into one approach in order to develop an efficient new targeted therapy for personalized medicine. Theranostics was a term created by combining the two words, therapy and diagnostics, into one to better present the early detection of various diseases and their respective personalized treatments. The following phrase also seems to reflect the core of theranostics – have your cake and eat it too – combining these two excellent ideas of nanotechnology and theranostics into inspiration for innovative creativities. Here, nano-theranostics extends further into the convergence with nanotechnology and personalized medicine, where many researchers and scientists have been developing cutting-edge nanotechnologies and applying them into tailored medicines for each individual. A concerted effort has been intensively invested to develop theranostic nanomaterials that can effectively combine therapeutic agents, targeting moieties, and imaging agents. For practical and clinical applications of nano-theranostics, all three components need to be cunningly integrated into nanoparticle-based carriers because of the three components feasible tailorability and functional diversity.

Nanoparticle-based systems can be a useful theranostic platform that can combine all the required components because the particle core can be tailored to load multiple therapeutic drugs and imaging agents and the particle surface can also be easily modified to attach the targeting moieties and surface-enhancing factors (long circulation and penetration capability). Furthermore, various nanomaterials (such as graphene, carbon nanotube, biocompatible polymers, superparamagnetic materials, gold nanocomposites, etc.) are constantly designed as theranostic nanoparticles that can monitor treatment and simultaneously enhance drug efficacy.

This special issue consists mainly of nanoparticle-based theranostics that combine therapeutic drugs, diagnostic imaging agents, and/or targeting moieties at the nanoscale. In addition, this issue is intended to highlight recent developments in nano-theranostics and provide useful information for the future research directions in theranostics. In this light, nano-theranostics could continue to have a promising future in cancer

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http://dx.doi.org/10.2147/IJN.S93426

diagnoses and treatments as well as other emerging needs, such as infection.

Acknowledgments

This Gachon Special Issue was supported from GRRC program of Gyeonggi province (GRRC Gachon 2014-B01, B02, B03, B04, Development of Nanomaterials for Biomedical Sensing Applications) and Gachon University, Graduate School.

Disclosure

The authors report no conflicts of interest in this work.

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