

Editorial

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The role of nanoparticles for biomedical application

Nanoparticles are polymeric particles in the nanometer size mostly range between 10 and 1000 nm. The unique properties of nanoparticles are suitable for biomedical applications due to their small size [1]. Nanoparticles can be attached to biomolecules to form nanoparticle–biomolecule conjugates that can be used in biomedical research and practices. Owing to the unique properties, nanoparticle–biomolecule conjugates have been capitalized to overcome the problems of absorption, drug delivery, drug distribution, and clearance [2, 3]. These characteristics have resulted in improved therapeutic efficacy, reduced side effects and reduced wastage of drug and thus have enhanced the bioavailability of drug at specific site in the right proportion for a prolonged period of time, leading to improved comfort and patient compliance with the conventional systems [4]. Nanoparticle–biomolecule conjugates have vast potential in addressing the failure of traditional therapeutics by providing site-specific targeting of active agents [5].

Since 1980, there has been a remarkable increase in approved nano-based pharmaceutical products commercially available [6, 7]. The nano-based products have been used for medical imaging [8], disease diagnoses [9], drug delivery, cancer treatment, gene therapy, and genetic disorders [10, 11] and chronic disease [12]. The potentials of using nanoparticles for intracellular mRNA delivery methods have expanded the current clinical use in vaccination, protein replacement therapies, and treatment of genetic diseases [13]. The toxicity of nanoparticle biomolecule conjugates or their degradation products has to be adequately addressed. In addition, the improvements in biocompatibility and efficacy remain as some of the key challenges to scientists and practitioners [14, 15].

Nanoparticle–biomolecule conjugates can serve as alternatives to conventional antibiotics and may help cope with the emerging need for suitable drug delivery systems [16]. Nanoparticle biomolecule conjugates have been applied to treat polymicrobial infections in chronic diabetic wounds [17].

The paper by Shaikh AJ et al. [18] in this issue represents one example of the potential use of nanoparticles and their drug conjugates for delivery of antibiotics against multidrug-resistant bacterial strains. The technique may be one of the armamentarium available to medical practitioners to deal with problematic bacterial infections. The experimental setup is not sophisticated and should be further explored whether the technique can have a role in optimizing nanoparticle and drug conjugates in dealing with challenging infections in specific areas.

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