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Editorial

Nanocarriers Based on Natural Polymers as Platforms for Drug and Gene Delivery Applications

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Nanomedicine is a fast growing field involving nanocarriers for biomedical applications. Colloidal nanocarriers, in their various forms, can offer endless opportunities in the drug delivery applications. Nanocarriers show improved targetability of therapeutic agents thus minimizing the unwanted side effects by their preferential accumulation at the target site [1]. Various types of natural and synthetic polymers have been utilized for fabrication of nanoparticles as drug and gene delivery systems. Natural polymers offer many advantages over their synthetic counterparts because of their abundance, excellent biocompatibility and biodegradability, and low cytotoxicity [2]. As a major advantage, natural polymers can be readily metabolized and cleared from a biological system through enzymatic or hydrolytic degradation while synthetic materials may induce toxicity, chronic inflammation, and clearance issues [3,4]. Thus, nanocarriers prepared from natural polymers constitute promising vehicles for targeted delivery of drugs and genes.

Therefore, the current issue embodies an in-depth discussion of colloidal nanocarriers based on natural polymers including proteins and polysaccharides by global experts in drug delivery with respect to formulation aspects, types, and site-specific drug targeting. Elzoghby *et al*. [5] discuss the use of natural polymeric nanocarriers for targeted drug delivery to the brain. In particular, the mechanism of enhanced BBB penetration by these nanoparticles is reviewed. On the other hand, the applications of natural polymeric nanocarriers compared to surfactant-based vesicles for pulmonary drug delivery are reviewed in this issue by Carter and Puig-Sellart [6].

Mohammed and associates [7] cover the knowledge about the recent advances in development of hybrid polymeric-magnetic nanoparticles, illustrating their main applications in drug delivery including chemotherapeutics, hyperthermia treatment, radio-therapeutics, and gene delivery. In a related approach, Muzzalupo and Tavano [8] give a brief overview about some types of stimuli-responsive nanocarriers, with the main focus on magnetic field-responsive devices obtained from natural polymers. Many polysaccharides have been successfully utilized as building blocks for preparation of nanoparticles as drug vehicles. Martínez *et al*. [9] discuss the role of anionic polysaccharides such as hyaluronate and heparin in the preparation of nanomedicines with anticancer applications. Similarly, nanoparticles synthesized from the polysaccharides chitosan, alginate and dextran as vehicles for bioactives are reviewed in this issue by Perez-Alvarez *et al*. [10], Jana *et al*. [11] and Ishak *et al*. [12], respectively. Bianco *et al*. [13] provide an overview of thermodynamic and kinetic aspects involved in the development of nanocarriers based on cationic biopolymers.

Proteins are considered as ideal carriers for the delivery of anti-cancer drugs, as demonstrated by nanometer-sized albumin-bound paclitaxel (Abraxane®) which is already in clinical use. Tezcaner and coworkers [14] here review the nanocarriers fabricated from plasma proteins including albumin, fibrinogen, lipoprotein, transferrin for drug and gene delivery applications. In addition, Kouchakzadeh and Shojaosadati [15] provide a comprehensive overview on the most recent findings in the area of utilization of protein-based nanoparticles for delivery of anticancer agents, as well as interpretation of the challenges encountered in the field. Finally, Varshosaz *et al*. [16] covers a broad spectrum of lipoproteins as hybrid nanosystems developed by a combination of proteins and lipids as non-viral drug and gene delivery systems.

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