Journla of Molecular Pharmaceutics & Organic Process Research
ISSN: 2329-9053
Jafari and Adibkia, J Mol Pharm Org Process Res 2015, 3:1
DOI: 10.4172/2329-9053.1000e118

Editorial
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Application of Hydroxyapatite Nanoparticle in the Drug Delivery Systems

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Editorial

Currently, nanosized materials are extensively used in design of the optical devices, catalysts, biosensors, imaging agent, drugs and gene delivery, etc. There are a large number of nanoparticles including gold nanoparticles, polymeric nanoparticles, quantum dots, bioceramic based nanoparticles and so on that are applied as carriers in the drug delivery systems. Definitely, dominant physicochemical properties of these materials such as small size and high surface to volume ratio lead to improvement of their effectiveness as a suitable carrier in drug and gene delivery [1-5].

In the recent decades, the production of bioceramics with nanostructures has attracted much attention for biomedical applications [6,7]. Among various types of bioceramics, hydroxyapatite (HAp) is one of the attractive bioceramics which is widely used in various fields of science such as tissue engineering, drug delivery systems and chromatographic purification [8-10].

HAp is the major mineral component of bone and teeth that belong to apatite family with general chemical formula of $M_{10}(XO_4)_6Z_2$, where $M=Ca^{2+}$, Sr^{2+}, Ba^{2+}, Na^{+}, Pb^{2+}, La^{3+}; $XO=PO_4^{3-}$, VO_4^{3-}, AsO_4^{3-}, CO_3^{2-} ; Z = OH^-, Cl^- ; F^-; CO_3^{2-} [11,12].

Recently, HAp, $Ca(PO_4)_6(OH)_2$, have attracted more attention in biomedical fields due to its exceptional features such as biocompatibility, bioactivity, osteoconductivity and osteoinductivity [12-14]. Bioactivity and biodegradability of HAp generally depend on the Ca/P ratio, crystallinity and phase purity. Generally, appropriate Ca/P ratio for preparation of Hap is 1.67 [15,16].

There are different methods for preparation of nano-sized HAp including wet chemical, hydrothermal, solid state reaction, sol-gel and microwave processes [17,18]. Wet chemical approach possesses several advantages over the other preparation techniques that include: simplicity, cost-effectiveness, low processing temperature and production of the highly pure products. Furthermore, this method is able to generate nanocrystalline powders, bulk amorphous nanoparticles and thin films [19,20].

Hap can incorporate the drug molecules either physically or chemically so that the drug retains intact until it reaches to the target site. It could also gradually degrade and then deliver the drug in a controlled manner over time [21,22]. So therefore, this bioseramic is an excellent candidate for targeted drug delivery and a promising bioscaffold in tissue engineering.

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Received December 12, 2014; **Accepted** December 15, 2014; **Published** December 23, 2014

Citation: Jafari S, Adibkia K (2015) Application of Hydroxyapatite Nanoparticle in the Drug Delivery Systems. J Mol Pharm Org Process Res 3: e118. doi: 10.4172/2329-9053.1000e118

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