Journal of Controlled Release 213 (2015) e8–e152

Contents lists available at ScienceDirect

Journal of Controlled Release

journal homepage: www.elsevier.com/locate/jconrel

Abstracts for The Third Symposium on Innovative Polymers for Controlled Delivery (SIPCD 2014)

Drug release mechanisms of chemically cross-linked albumin microparticles: Effect of the matrix erosion

Danielly L.A. Sitta[a], Marcos R. Guilherme[a], Edvani C. Muniz[a], Artur J.M. Valente[b], Adley F. Rubira[a,*]

[a]*Department of Chemistry, State University of Maringá, Maringá CEP 87020-900, Paraná, Brazil*

[b]*Department of Chemistry, University of Coimbra, Coimbra 3004-535, Portugal*

*Corresponding author.

E-mail address: afrubira@uem.br (A.F. Rubira).

One of the most promising areas of particles is the research and development of new pharmaceutical formulations, being that the main application is aimed towards the drug delivery. Among the various materials used in the production of nano and microparticles, there has been a considerable interest in the proteins as a starting substance for synthesis of more sophisticated release systems that may preserve the molecular structure of more potent and specific drugs [1]. Both bovine serum albumin (BSA) and human serum albumin (HSA) are used in the production of nano/microparticles [1,2] in view of their structural similarity that corresponds to 75% of the homologous sequence. BSA is more suitable for in vivo tests due to its lower cost.

This work aimed at producing protein microparticles from BSA using a hydrochloric emulsion for uses in drug delivery systems. Vitamin B12 (Vit-B12) was used as the model drug. To obtain such a system, BSA was modified with maleic anhydride (MAy) in water, because only a small number of proteins may sustain dissolution in an organic medium without their molecular recognition properties being lost. The idea was to use the vinyl bonds in functionalized BSA (BSAMAy) as a radical cross-linking/polymerization approach for reaction with *N*, *N*-dimethylacrylamide (DMAAm) in the emulsion. The microparticles produced at 15 min of stirring without PVA showed the best results in terms of size, homogeneity, and sphericity (Fig. 1a). In such a case, BSA played a role as a surface active agent, replacing PVA. For longer stirring times, BSA was unable to act as an emulsifier. These microparticles showed an uncommon release profile, consisting in a two-step release mechanism, at the pH range studied (Fig. 1b). Considering that a two-step release mechanism is occurring, the experimental data were adjusted by applying modified power law and Weibull equations in order to describe release mechanism n and release rate constant k, respectively. Each one of the release stages was related to a specific value of n and k. The second stage was driven by a super case II transport mechanism, as a result of diffusion, macromolecular relaxation, and erosion. A third model, described by Hixson–Crowell, was used to confirm the erosion mechanism.

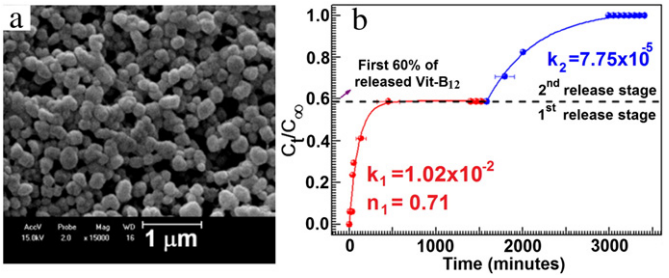

Fig. 1. (a) SEM image of BSA microparticles produced at 15 min of stirring, without PVA. (b) Time-dependent release curve of Vit-B12 from the albumin microparticles at 37 °C for pH 2.

Keywords: albumin, drug delivery, emulsion, erosion, microparticles, drug release kinetics

References

[1] F. Iemma, U.G. Spizzirri, R. Muzzalupo, F. Puoci, S. Trombino, N. Picci, Spherical hydrophilic microparticles obtained by the radical copolymerization of functionalised bovine serum albumin, Colloid Polym. Sci. 283 (2004) 250–256.

[2] M.M. Jahanshahi, Z. Babaei, Protein nanoparticle: a unique system as drug delivery vehicles, Afr. J. Biotechnol. 7 (2008) 4926–4934.

doi:10.1016/j.jconrel.2015.05.009

Antibacterial ciprofloxacin hydrochloride incorporated PVA/regenerated silk fibroin nanofibers composite for wound dressing applications

Ahmed A. El-Shanshory[a,b], Weiming Chen[b], Hany A. El-Hamshary[c], Salem S. Al-Deyab[c], Xiumei Mo[b,*]

[a]*College of Textiles, Donghua University, Shanghai 201620, China*

[b]*College of Chemistry, Chemical Engineering and Biotechnology, Donghua University, Shanghai 201620, China*

[c]*Department of Chemistry, College of Science, King Saud University, Riyadh 11451, Kingdom of Saudi Arabia*

*Corresponding author.

E-mail addresses: shansho_medo@yahoo.com (A.A. El-Shanshory), xmm@dhu.edu.cn (X. Mo).

In order to avoid the harmful effects of organic solvents, many water soluble polymers such as polyvinyl alcohol (PVA), polyethylene oxide (PEO), silk fibroin (SF) have been used to fabricate green, Eco friendly electrospun nanofibers for biomedical applications. On the other hand SF is an attractive natural fibrous protein, which has been used for various biomedical applications including tissue

0168-3659/$ – see front matter.