Self-assembling polysaccharide-based nanohydrogels for drug delivery applications

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The nanohydrogel systems (NHs) are gaining an increasing interest in the field of drug delivery and for biomedical applications, as they can combine the favourable properties of nanotechnologies and the features of the hydrogels.

In this contest, our work was focused on the preparation of a new nanoparticulate hydrogel carriers using the biocompatible polysaccharides gellan (Ge) [1,2] and hyaluronic acid (HA) [3-6]as starting materials. The HA- and Ge-based nanostructures were obtained by self-assembling of polymeric chains previously derivatized with hydrophobic moieties, such as prednisolone (Pred) [1,2], cholesterol (CH) [1-3,5,6] or riboflavin (Rfv) [4]. We obtained self-assembled NHs from hydrophobized polysaccharides according to the scheme described in Figure 1.

NHs were prepared by bath sonication, nanoprecipitation or by autoclaving process, and then they were characterized in terms of dimensions, polydispersity, ζ-potential and stability by means of dynamic light scattering and Cryo-TEM microscopy (Figure 2).

Figure 1. Self-assembling process of hydrophobized polysaccharides in water

These systems are versatile and stable and show an excellent biocompatibility. We successfully loaded NHs with hydrophilic or hydrophobic drugs, as well as with therapeutic proteins.

In vitro evaluation of biological activity of drug-loaded NHs in anticancer and antibiotic treatments showed an enhanced therapeutic activity of such systems compared to the free drugs.