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Fabrication of gasotransmitter releasing amphiphilic copolymeric nanoparticles

The amphiphilic polymers can be used to nano-structured materials because of its both characterizations of hydrophilicity and hydrophobicity. When the polymer exists in an appropriate concentration, the polymers perform distinct self-assembled structures such as sheet, micelles, and polymersomes. The polymeric nanoparticles have emerged in drug delivery systems since it is easy to prepare and encapsulate drug. mPEG-PLGA is representative of biodegradable and biocompatible polymer which has hydrolysis property and low toxicity against human cells and tissues. Since the co-polymer has amphiphilic which can be easy to form various self-assembled structures, we synthesized and prepared co-polymeric nanoparticles having bi-layered using amphiphilic co-polymers. Nitric oxide (NO) and Hydrogen sulfide (H2S), as well as carbon monoxide (CO), is called “gasotransmitter” and they do mediate various physiological functions. NO is endogenously produced by nitric oxide synthase and convert GTP to cGMP and it stimulates protein kinase G (PKG). PKG provides the signals to regulate physiological functions through controlling ion channels. H2S can inhibit PDE5A that can degrade cGMP. By inhibiting degradation of cGMP, NO signals can be ultimately amplified by H2S. In this study, Co-delivery system with NO and H2S has been proposed via biocompatible and biodegradable polymers; poly(ethylene glycol-b-lactic-co-glycolic-co-hydroxymethyl propionic acid) (functionalized PLGA). The NO-releasing polymers were synthesized by S-nitrosation reaction can form S-nitrosothiol and then, encapsulating GYY4137 as an H2S releasing agent. The nanoparticles exhibited slow releasing behavior, low cytotoxicity and accelerating tube formation. These results provide feasibility of medical applications through NO and H2S crosstalk.

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