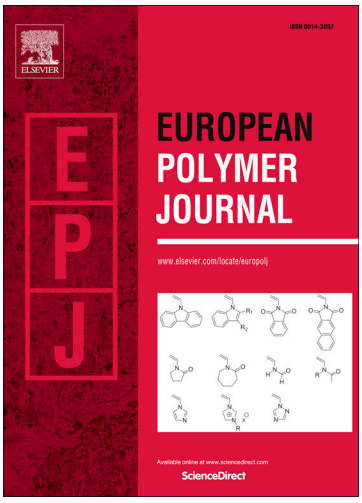

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Preparation of diblock amphiphilic polypeptide nanoparticles for medical applications

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Abstract We report a series of diblock amphiphilic copolypeptides consisting of polylysine and phenylalanine that can self-assemble into different kinds of nanoparticles according to the length ratio of the hydrophobic and hydrophilic chains. Dynamic light scattering, transmission electron microscopy, and atomic force microscopy confirmed the self-assembled structure of the diblock amphiphilic polypeptide. The copolymers could self-assemble into rodlike micelles, vesicles, and wormlike vesicles with different ratios of the hydrophobic and hydrophilic chains. The critical vesicle formation concentration and DOX loading and in vitro release were also studied. These antibacterial peptide nanoparticles are promising candidate for biomedical application, and they can inhibit bacterial infection simultaneously.

Keywords: amphiphilic copolymer, self-assemble, drug delivery, antibacterial peptide, vesicle.

1. INTRODUCTION

Given their excellent biodegradability and biocompatibility [1-3], a number of polypeptides have been widely used in biomedical applications, including drug delivery [4-7], tissue engineering [8-10], and wound repair [11-13]. Similar to amphiphilic block copolymers, amphiphilic block copolypeptides composed of hydrophobic and hydrophilic amino acids can also self-assemble into nanoparticles with various structures, such as vesicles [14-16], micelles [17-19], and nanofibers [20-22], which have attracted people's attention. These peptide-based supramolecular systems are promising in advanced medicine for novel therapy. [23]

Multidrug-resistant bacteria resulting from the overuse of antibiotics have become an increasingly serious issue in clinical treatment.[24, 25] Antimicrobial peptides (AMPs) have excellent and broad-spectrum antimicrobial activity to both Gram-positive and Gram-negative bacteria and candida. [26, 27] Most importantly, bacterial resistance to AMPs is difficult to develop, which makes them credible candidates to replace antibiotics. [28] Most of the antibacterial peptides are cationic AMPs, and the structure of AMPs includes two basic elements: cationic amino acid