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Synthesis of poly(L-lysine)-based star polypeptides as potent antimicrobial agents combating multidrug-resistant bacteria

Ying Da Lai

National Cheng Kung University, Taiwan

Antimicrobial polypeptides has received significant attention because the challenge of serious multi-drug resistance of bacteria has been considered the most important issue in the world. We report the synthesis of star homopolypeptides and copolypeptides and their evaluation as antimicrobial agents. It is known that dendritic or star-shaped structures facilitate antimicrobial polypeptides to efficiently interact with cell membranes and consequently enhance antimicrobial potency. Polypeptides with different arms were synthesized by Ring-Opening Polymerization (ROP) of N-Carboxy Anhydrides (NCAs) using initiators with corresponded number of functional group. GPC and NMR analyses confirmed the successful synthesis of these star polypeptides. Cationic, star polypeptides comprising poly(L-lysine) (PLL) were designed and synthesized as antimicrobial agents against *Escherichia coli*, *Klebsiella pneumoniae* (KP), *Pseudomonas aeruginosa* and Enterohemorrhagic *Escherichia coli* (EHEC) which are common pathogens found in nosocomial infection. It was found that the star polypeptides exhibited the enhancement of antimicrobial efficacy as compared to linear counterparts without hemolysis and significant cytotoxicity. Unlike the synthesis of antimicrobial, peptide-based dendrimers requiring complex and tedious reaction steps, the synthesis of these star polypeptides is simple and additional functionality can be incorporated by conjugation. Furthermore, antimicrobial polypeptides can overcome antibiotic resistance owing to their unique antibacterial process. Our present results demonstrated that these star polypeptides are promising antibacterial agents for the treatment of bacteria induced disease.

Biography

Ying-Da, Lai, 24 years old and he graduated from National Chung Cheng University and major in chemical engineering. Now, he is a master student in department of chemical engineering, National Cheng Kung University, and my thesis objective focuses on the synthesis of polypeptides which is applied on antibacterial agents. Good knowledge in the synthesis of polymer experienced in handling reactions under the glove box and the preparation of antibacterial experiment under Laminar flow and Biological Safety Cabinet. He participated in annual meeting of the Polymer Society, Taipei in 2017 and got the championship in the poster competition. With my great skill of polymer organic synthesis, He is confident that he can do well in the field of polymeric biomaterials. He is eager to be one of the scientists who can design promising antimicrobial agents to solve the tricky issue of the rising of antimicrobial resistance.

laiyingda@gmail.com

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