Abstract (บทคัดย่อ)

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Synthesis and Characterizations of Functional Peptides: Their Applications in Biopharmaceutical Drug Developments

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This research addressed the two facets of peptide sciences using chemical synthesis and various characterization methods as the main vehicles. The first part is about the synthesis and characterization of psalmopeotoxins, anti-malarial cysteine-knot peptides from psalmopoeus cambridgei. Our group reported the first chemical synthesis of these peptides whose complex architecture resulting from multiple disulfide bridges. We also varied the disulfide bonds to probe its impact on stability and anti-plasmodial activities of these peptides. The results showed that removal of disulfide bonds could impact both stability and anti-plasmodial activities. The results were further analyzed by molecular modeling which confirmed the experimental findings. Future works will likely be focus on probing the source of antiplasmodial activity of these peptides in order to optimize their stability and activity.

The second part of this research is on the effects of hydrophobic amino acids on self-assembling peptides. Herein, three self-assembling peptides were designed based on basic structural principles of self-assembling peptide with high β-sheet formation propensity. Each peptide has different charge properties, leading to different chemical properties and the ability to adopt β-sheet and self-assembly. The peptides were synthesized by solid phase peptide synthesis, characterized by biophysical methods to assess the structure and stability, and assessed by microscopy (TEM and AFM). Analysis of all the data suggested that hydrophilic amino acids were critical for the stability and structure of the assemblies. The mechanism of fibril formation were β-sheet mediated could also be deduced. Future works will likely be focused on applying this self-assembling peptide platform to modulate pharmacodynamic properties of medicines.

Keywords : peptide synthesis, biophysical characterization, self-assembling peptides