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Peptide Induced Self-Assembly of Collagen Proteins into Periodic Fiber

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Abstract

Statement of the Problem: The potential applications of recombinant bacterial collagen-like proteins are limited by lacking high order structures to form biomaterials. Findings: To improve the self-assembly ability of collagen-like proteins, we have designed collagen-like engineered proteins flanked by N- and C-terminal (PPG)10 sequences. Upon expression in E. coli, these designs self-assembled into axial D-periodic fibers with spacing matching the length of the bacterial collagen domain. Computational analysis of self-assembly has given insight into the mechanism behind the banded fiber morphology. The interactions between collagen designs and cultured fibroblasts are being studied to determine how fiber morphology affects cell structure and viability. This study provides a design strategy for the production of collagen proteins with functional sequences and tunable morphology for biomimetic materials in tissue engineering applications. Conclusion & Significance: The collagen proteins flanked by N- and C-terminal (PPG)10 sequence can be successfully expressed in E.coli and self-assembled into D-periodic fibers regardless of collagen-like domain. Through regulated the length of the collagen domain, we can change the length of D-periodicity. Computational analysis of self-assembly has given insight into the mechanism behind the banded fiber morphology, which utilized the most stable combination method, a full overlap of (PPG)10. The design strategy modulated the length and diversity of collagen fiber at the molecular level directly, expanding the flexibility of the collagen proteins self-assembly.

Biography:

Jinyuan has her expertise in evaluation and passion in improving the collagen fibers. Her use peptide induced self-assembly of collagen proteins into periodic fiber and use the sequence dependence model prediction the interaction of collagen protein. At the same time, he improved the diffusion limited aggregation model for the process of collagen self-assembly.

Speaker Publications:

1. Kar, K.; Ibrar, S.; Nanda, V.; Getz, T. M.; Kunapuli, S. P.; Brodsky, B., Aromatic interactions promote self-association of collagen triple-helical peptides to higher-order structures. Biochemistry 2009, 48 (33), 7959-7968.
2. McGuinness, K.; Khan, I. J.; Nanda, V., Morphological Diversity and Polymorphism of Self-Assembling Collagen Peptides Controlled by Length of Hydrophobic Domains. Acs Nano 2014, 8 (12), 12514-12523.
3. Peng, Y. Y.; Howell, L.; Stoichevska, V.; Werkmeister, J. A.; Dumsday, G. J.; Ramshaw, J. A., Towards scalable production of a collagen-like protein from Streptococcus pyogenes for biomedical applications. Microbial cell factories 2012, 11 (1), 146.
4. Yoshizumi, A.; Yu, Z.; Silva, T.; Thiagarajan, G.; Ramshaw, J. A.; Inouye, M.; Brodsky, B., Self-association of streptococcus pyogenes collagen-like constructs into higher order structures. Protein Science 2009, 18 (6), 1241-1251.
5. Rele, S.; Song, Y.; Apkarian, R. P.; Qu, Z.; Conticello, V. P.; Chaikof, E. L., D-periodic collagen-mimetic microfibers. Journal of the American Chemical Society 2007, 129 (47), 14780-14787.
6. Kaur, P. J.; Strawn, R.; Bai, H.; Xu, K.; Ordas, G.; Matsui, H.; Xu, Y., The self-assembly of a mini-fibril with axial periodicity from a designed collagen-mimetic triple helix. Journal of Biological Chemistry 2015, 290 (14), 9251-9261.

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