Designer Angiogenic Peptides for Tissue Regeneration

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Introduction

- designer β-sheet forming self-assembling peptide hydrogels (SAPH) [based on a canonical K-$(SL)_6$-K self-assembling unit]

- modular design - interchangeable signaling domains –maintenance of β-sheet leading to robust angiogenic, neurogenic, dentinogenic and immunomodulatory signaling.

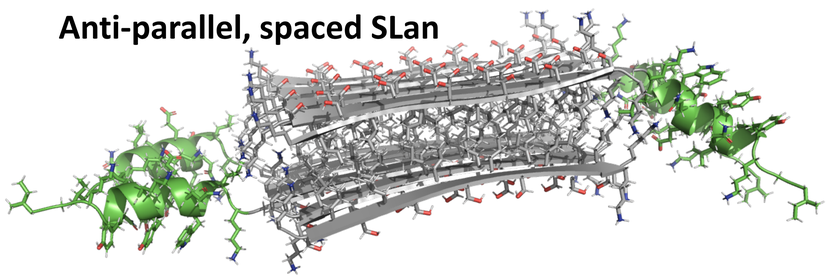
- efficacy of our angiogenic hydrogels in rodent and canine models for hind limb ischemia, diabetic wound healing, ocular wound healing, and dental pulp regeneration.

- In-depth study of:
  i) spatiotemporal signaling domain presentation

  ii) optimization for controlled and tunable in vivo angiogenesis

  iii) Design of novel angiogenic mimics

Anti-parallel, spaced SLan



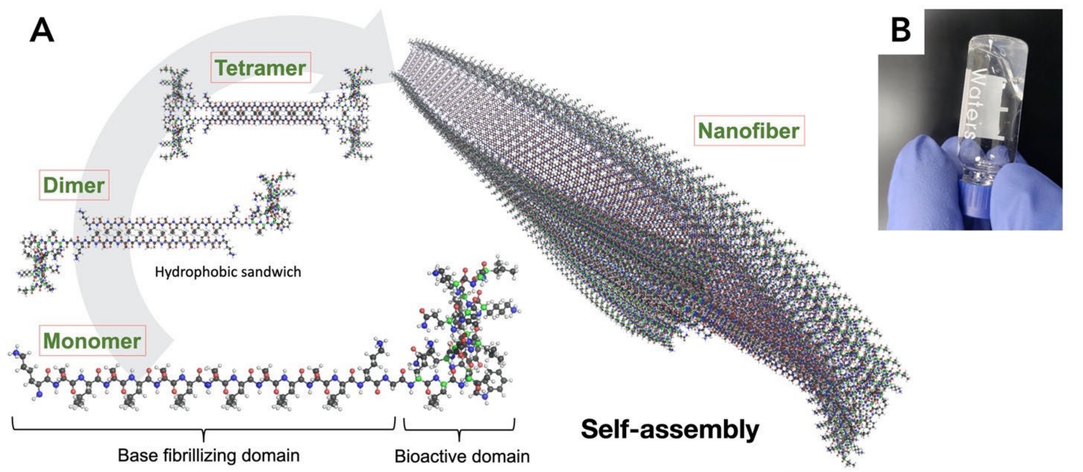
Methods

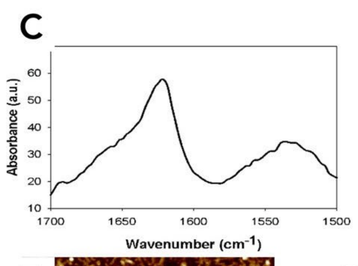
- peptide binding modeled in silico

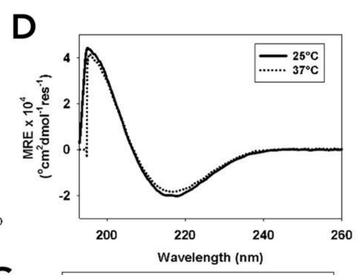
- Molecular-level information inferred in material designs can be probed directly by high-resolution measurements like cryo-EM or solid-state NMR.

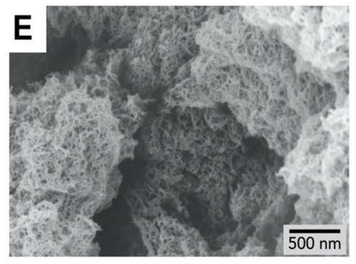
- Here we present a rationalized design approach for the generation of self-assembling peptides with pro-angiogenic effect, termed SLan.

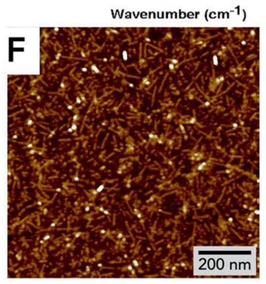
Results

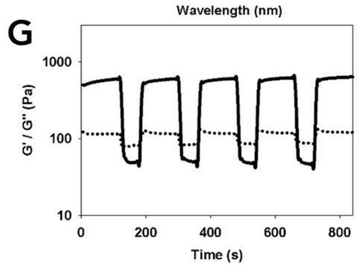


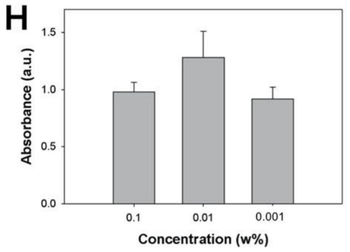


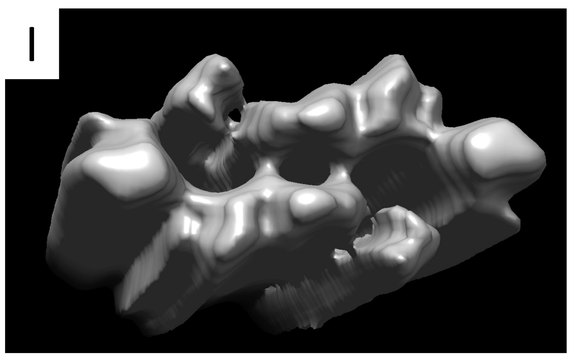


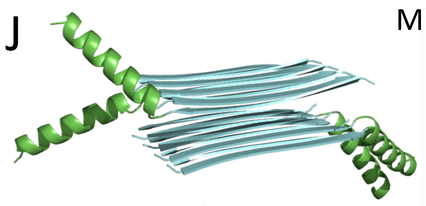


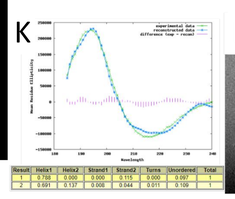


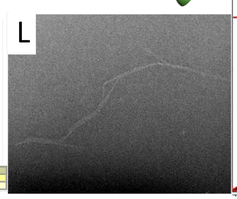


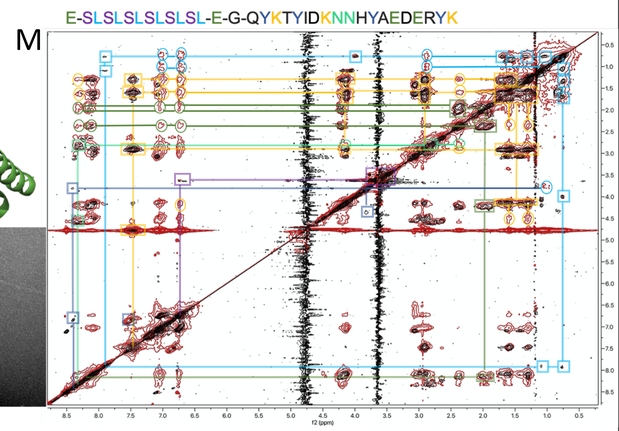












- β-sheet forming

- Nanofibrous

- Density impacts folding – and signaling?

- Solution state NMR tells monomers

- Solid-state NMR?
  - Labelled?

- Negatively stained TEM shows fibers

- ITC for kinetics?

- Cryo-EM shows order

Discussion

- peptide binding modeled in silico

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