Protease-sensitive ELPs as a route towards dynamic biomaterials

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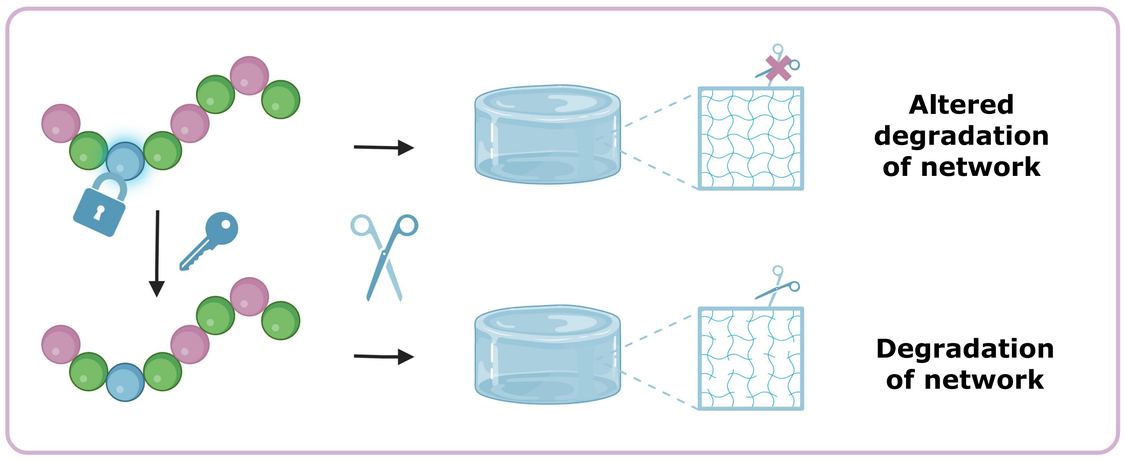
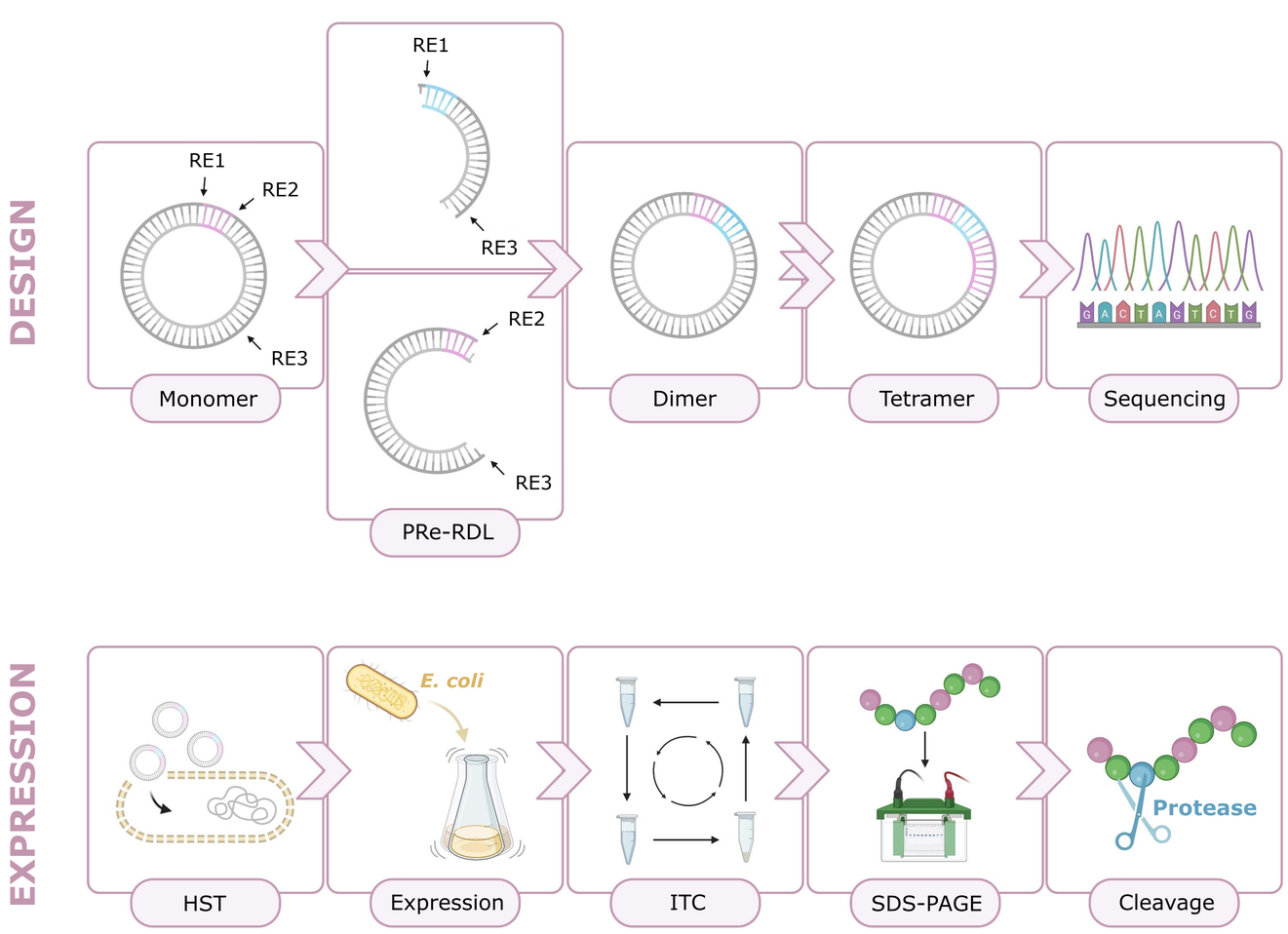
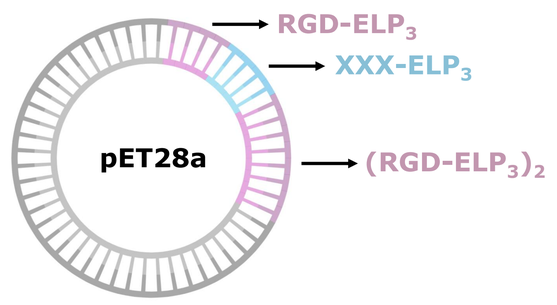
INTRODUCTION

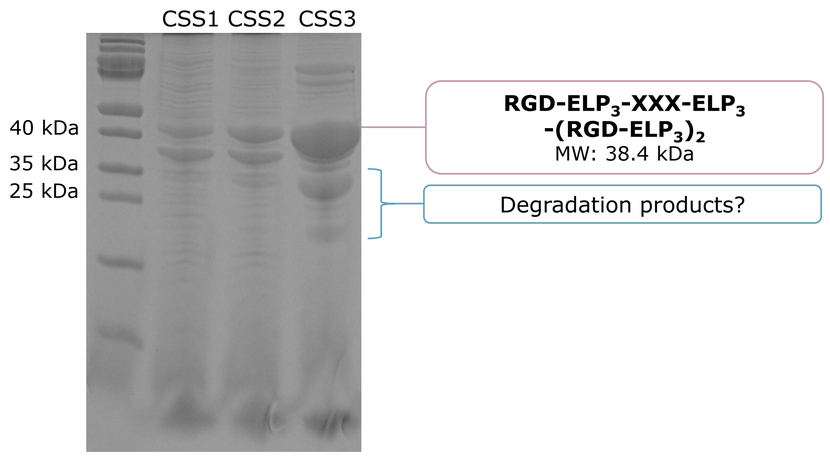
Materials for tissue engineering have advanced from static scaffolds to dynamic, tissue-responsive constructs. Ideally, a scaffold should degrade in step with new tissue formation. To study this degradation in protein-based scaffolds, a protease-sensitive ELP construct was designed and expressed in *E. coli* to enable protein and, thus, scaffold breakdown. In reversibly caging certain amino acids in the protease site, it is expected that degradation in the presence of protease will be altered, leading to new routes towards controlled biodegradation, thereby contributing to the rapidly evolving field of dynamic biomaterials.



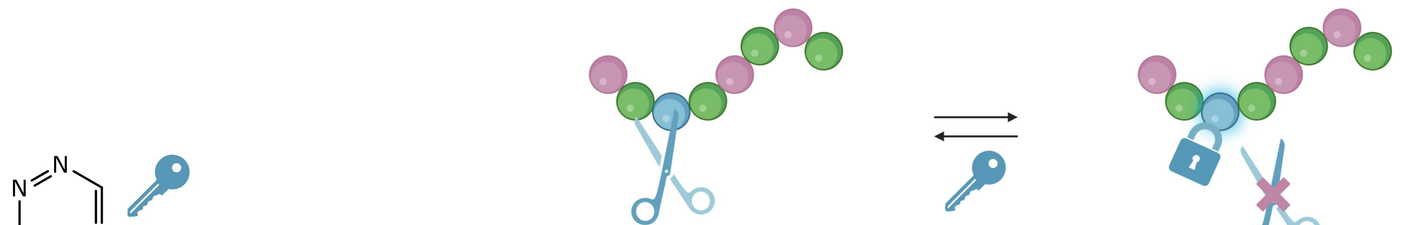
DESIGN AND EXPRESSION OF PROTEASE-SENSITIVE ELPs

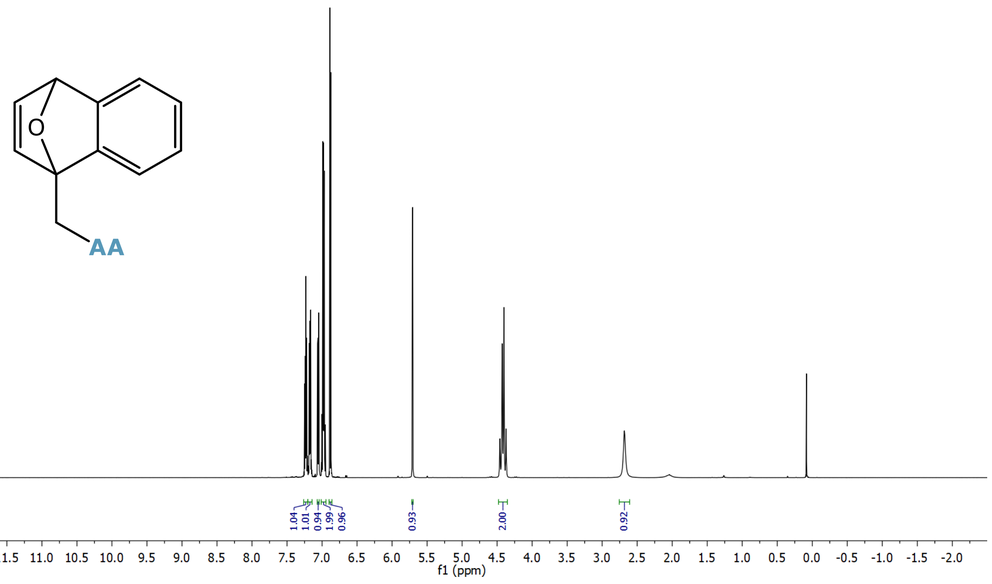


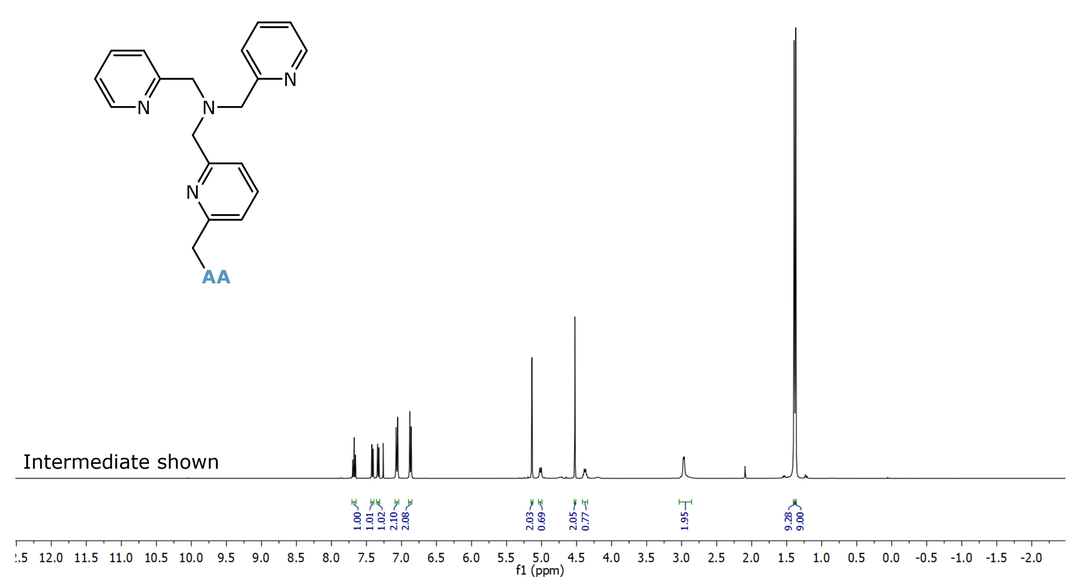




TOWARDS CONTROLLED BIODEGRADATION







CONCLUSIONS

- Plasmid containing tetrameric ELP construct was successfully synthesized.
- Tetrameric ELP was successfully expressed in *E. coli* and purified via inverse transition cycling, although some possible degradation products were observed.
- Synthesis of amino acid cages in the protease site is in progress.

OUTLOOK

- Protease-sensitive ELPs will be incorporated into hydrogels using PEG-NHS.
- Synthesis of cages is ongoing and will be used to attempt control over degradation in proteins and hydrogels.
- Cleavage of ELPs and hydrogels with protease will be tested in the absence and presence of cages and release triggers.

[1] ***Chem. Commun.,*** 2017, **53**, 6271. **[2]** ***PNAS***, 2016, 113(50), 14219-14224.

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