Taming biodegradation in peptide-based hydrogels

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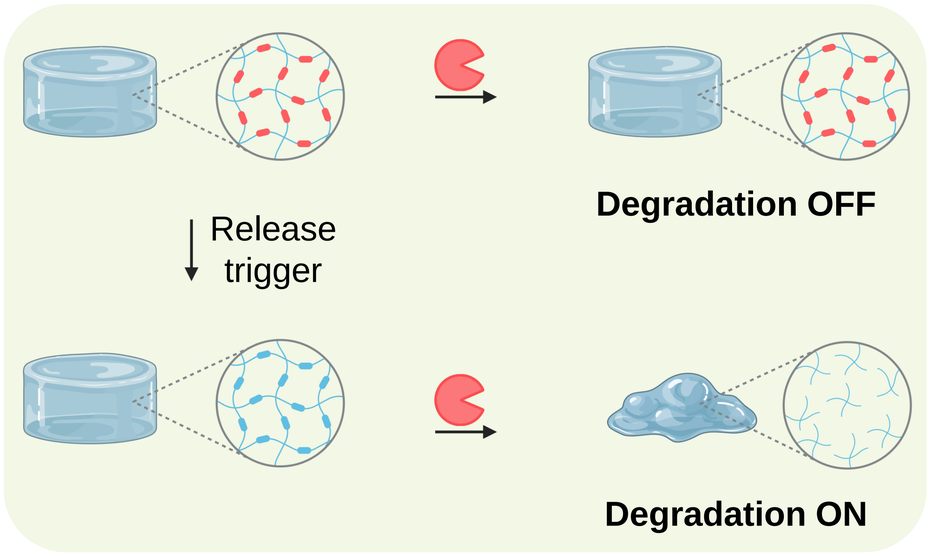
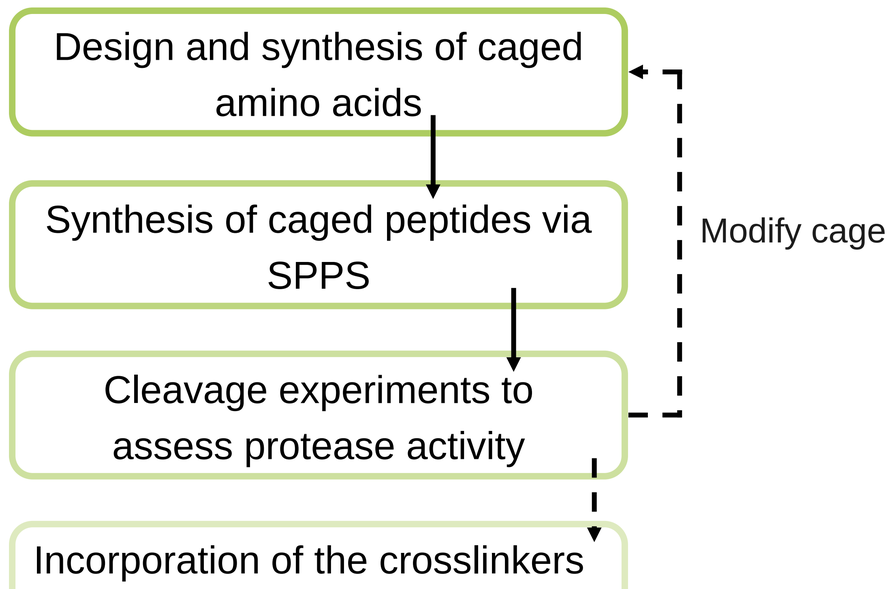
INTRODUCTION



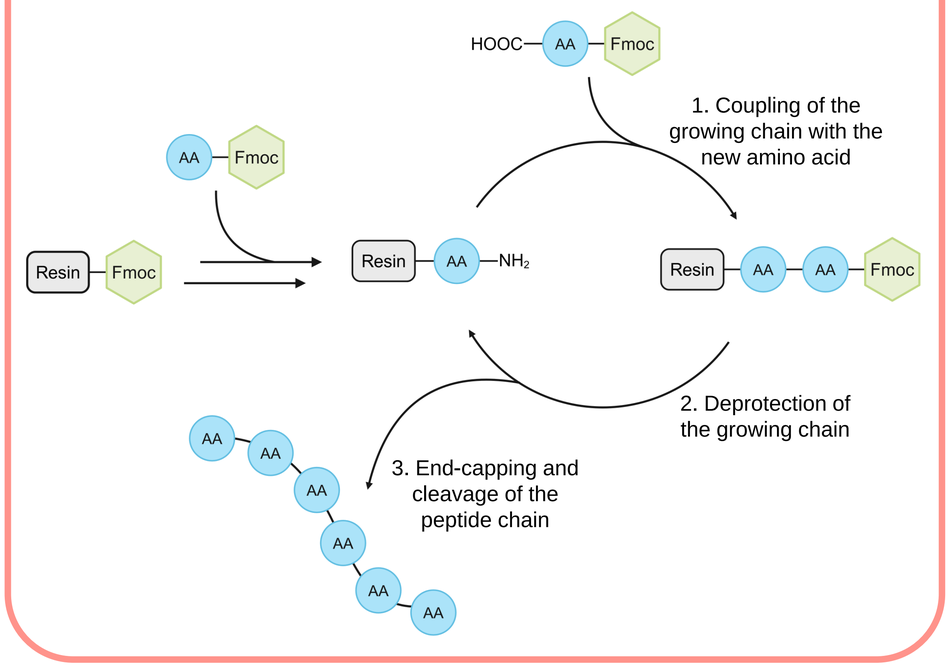
The ideal hydrogel creates a dynamic environment that answers the needs of the developing tissue. It should remain stable during the initial phases of tissue development but fully degrade once the material has fulfilled its purpose.

This project envisions a hydrogel crosslinked with caged TEV-sensitive peptides. The caging prevents degradation in the presence of the protease, but once the cage is removed through a release trigger, degradation can resume.

METHODOLOGY

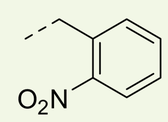


Solid-phase peptide synthesis



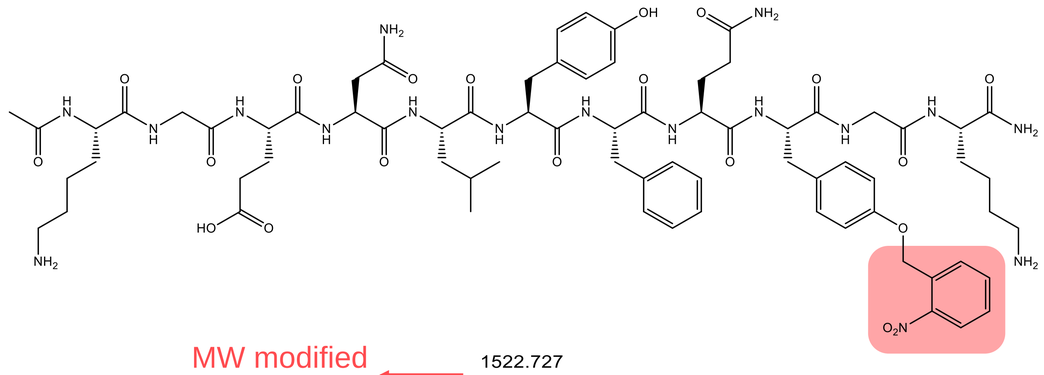
CAGE 1: PHOTOCAGE

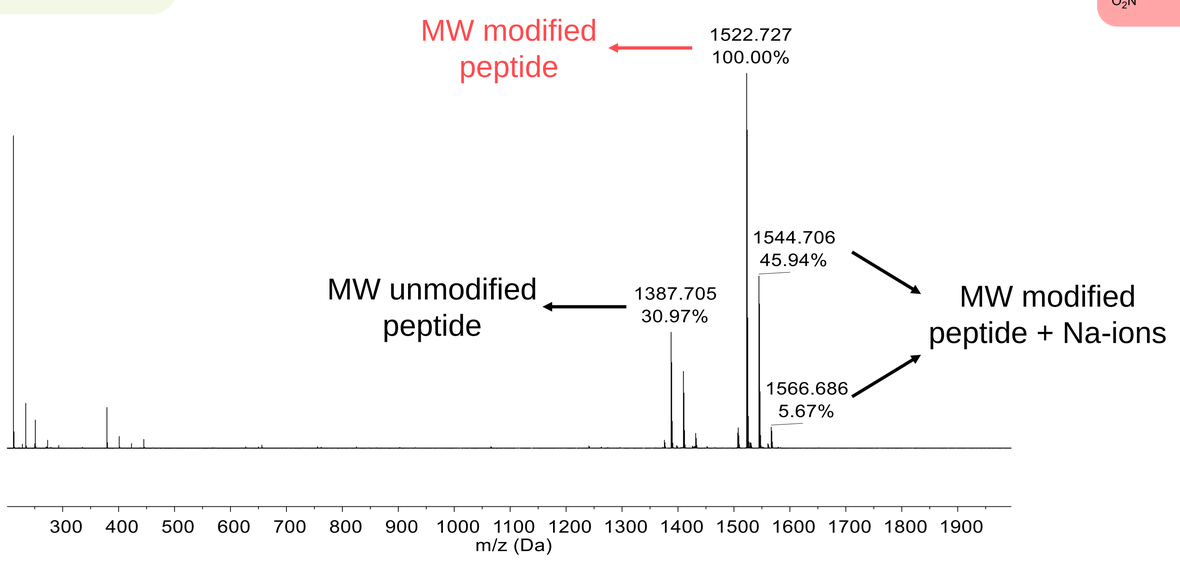
Cage



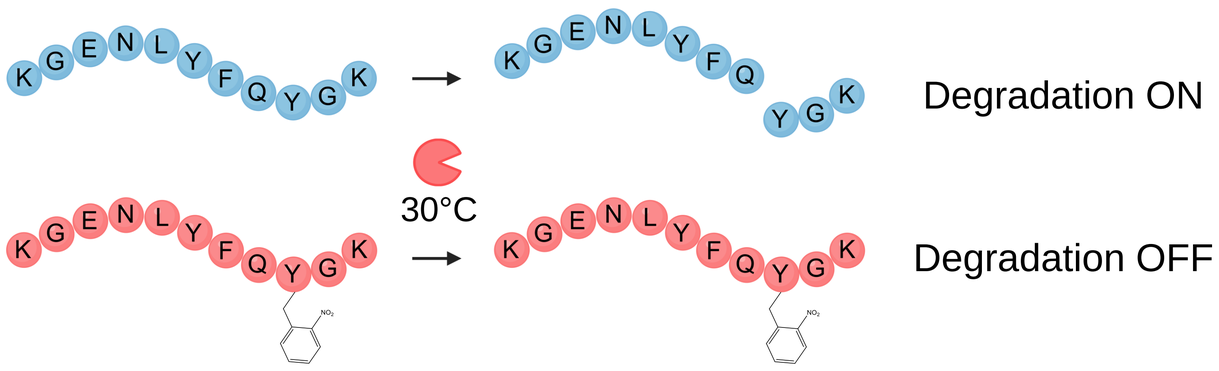
Release trigger

365 nm





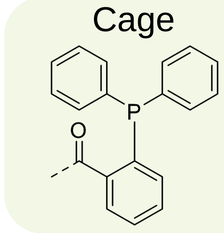
Cleavage experiments



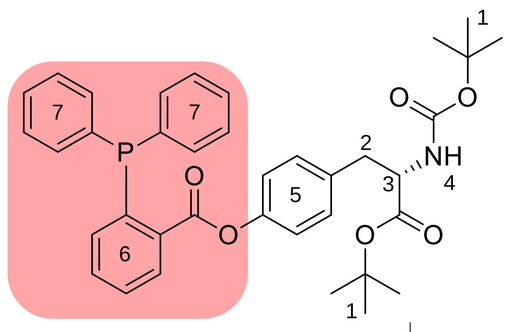
The TEV-sensitive peptide was cleaved within six hours, while the photocaged peptide showed slower cleavage, with only minor cleavage after 60 hours. Nevertheless, replicating these results has been difficult, and it remains uncertain if the photocage interferes with TEV-protease due to steric effects or other interactions.

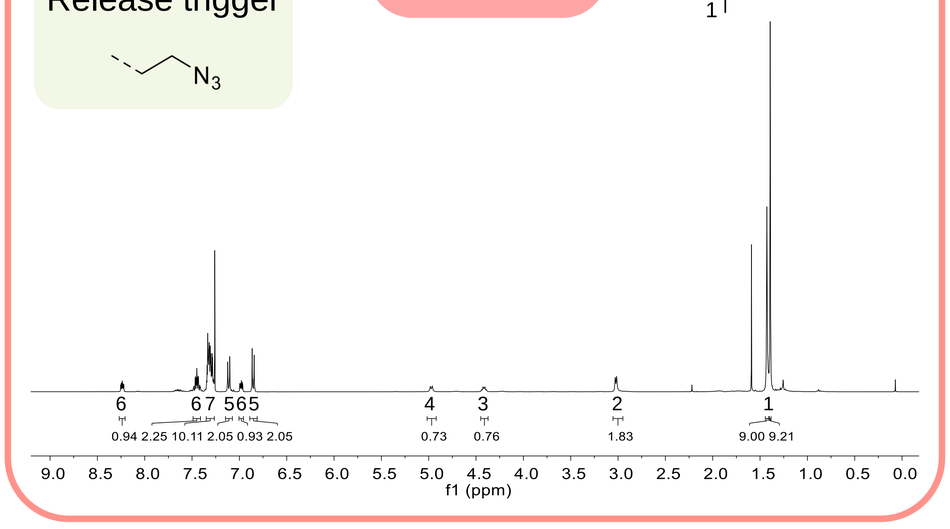
CAGE 2: CLICK-TO-RELEASE

Cage



Release trigger





FUTURE OUTLOOK

- More cleavage experiments will be performed with both protecting groups. Depending on the results, other cages could be considered.
- If proof-of-concept is obtained, the project could be expanded to more relevant enzymes.
- Both the TEV-sensitive and caged peptides will be incorporated into model PEG-based hydrogels.

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