Docket #: S23-364

Cell-protective biomaterials based on protease-activated elastin-like polypeptides

Elastin-like polypeptides (ELPs) are promising biomaterials for medical applications due to their non-immunogenicity, scalable synthesis, and tunable self-assembly. Typically, temperature triggers ELP self-assembly, but this method is challenged by the constant human body temperature.

To address this issue, Stanford researchers have invented an ELP that self-assembles in response to a biological stimulus (protease) and can function in isothermal environments like genetically engineered cells, blood vessels, and cancerous tumors. The protease-responsive ELP remains soluble at physiological temperatures but produces an insoluble fragment that self-assembles upon protease exposure.

Stage of Development
In vitro: proof of concept

Applications

- Integrated into technologies that rely on therapeutic cells
- Hemostatic materials for internal bleeding
- Reporters for protease development
- Stimuli-responsive tags for protein purification
- Stimuli-responsive biomaterials for drug delivery

Advantages

- Greater spatiotemporal control over ELP self-assembly in vivo

- Non-immunogenic
- Easy to produce
- Allows isothermal self-assembly

Publications

- Brendan M. Wirtz, Allison G. Yun, Chloe Wick, Xiaojing J. Gao, Danielle J. Mai (9 July 2024). Protease-Driven Phase Separation of Elastin-Like Polypeptides. *Biomacromolecules*, Virtual special issue "Peptide Materials."

Patents

- Published Application: WO2025076213

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