Adhesive Elastin-based Proteins as Soft-tissue Surgical Glues

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Developing a viable soft tissue adhesive can eliminate the needs for sutures, which often cause further tissue damage in clinical settings. Adhesives that demonstrate biocompatibility, functionality in wet environment, balanced adhesive and cohesive forces, and mechanical properties similar to that of soft tissues may prove to be a successful alternative. Mussel adhesive proteins (MAPs), flexible and biocompatible proteins that have strong adherence underwater, and Elastin, a fiber that can easily stretch and retract, demonstrate these properties. Combining DOPA (3,4-dihydroxyphenylalanine--the amino acid that is responsible for the cross-linking and adhesion in MAPs) and ELPs (Elastin-Like Polypeptides) together, a recombinant protein is designed, over-expressed, and produced in the host bacteria E. coli through the fermentation process. After purification of this protein via temperature cycling and pH adjustments, an average protein yield of 96+/-61 mg/L of culture with a purity of 91%+/-5% is produced. If a large amount of this protein may be harvested, it could be used not only for just as surgical adhesives, but also for other applications in the medical field such as cartilage repair and cellular localization. Therefore, it is crucial an effective purification process is established for the production of this protein. Turbidity testing of this protein at different temperatures is conducted along with testing of the protein's solubility at different pHs. These tests can help determine the exact temperature and pH at which the protein transitions during the temperature cycling of the purification process, so that the process can be streamlined. Further testing on cytocompatibility, tensile strength, and adhesive strength may be conducted later.

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