Biofabrication with biopolymers and enzymes: potential for constructing scaffolds from soft matter.

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Abstract
PURPOSE: Regenerative medicine will benefit from technologies capable of fabricating soft matter with appropriate architectures, assembled cells, and spatially organized physical, chemical and biological cues.

METHODS: Electrical potentials are applied to submerged electrodes to perform cathodic and anodic reactions that direct the deposition of macromolecules. Tyrosinase and microbial transglutaminase are used to catalyze macromolecular grafting and crosslinking of proteins.

RESULTS: Electrodeposition of the polysaccharides chitosan and alginate allow hydrogel films to be formed in response to electrical potentials. Crosslinking of gelatin allows replica molding of soft matter to create hydrogel films with topological structure.

CONCLUSIONS: Biofabrication with biological materials and mechanisms provides new approaches for soft matter engineering with appropriate architectures, assembled cells, and spatially organized physical, chemical and biological cues.

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