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Spectrophotometric Evaluation of Custom Microalgae-Based Bioink Formulations for Optimized Green Bioprinting

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Abstract : Green bioprinting, from the context of merging 3D bioprinting with microalgae cell organization, holds promise for industrial-scale optimization. This study employs spectrophotometric analysis to explore post-bioprinting cell growth density variation within hybrid hydrogel biomaterial scaffolds. Three hydrogel biomaterials—Alginic acid sodium salt (ALGINATE), Nanofibrillated Cellulose (NFC) – TEMPO, and CarboxyMethyl Cellulose (CMC)—are chosen for their scaffolding capabilities. Bioink development and analysis of their impact on cell proliferation and morphology are conducted. Chlorella microalgae cell growth within hydrogel compositions is probed using absorbance measurements, with additional assessment of shear thinning properties. Notably, NFC exhibits reduced shear thinning compared to CMC. Results reveal that while mono-hydrogel substrates with pronounced adhesion inhibit Chlorella cell proliferation, Alginate fosters increased cell concentration alongside a slight viscosity rise.

Keywords : green bioprinting, 3d bioprinting, microalgae cell, hybrid hydrogel scaffolds, spectrophotometric analysis, bioink development, shear thinning properties
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