BIO-INSPIRED 3D-SCAFFOLDS FOR FROM MARINE SPONGES: ECM POLYMERS AND DECELLULARIZED TISSUES FOR ADVANCED CELL CULTURE

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Résumé

Collagens and sulfated polysaccharides from marine sponges show promising potential for developing 3D scaffolds for in vitro cell cultures (1). Moreover, the intricate and highly organized 3D architecture of marine sponges provides bioinspiration for innovative matrix design. Given the unique properties of marine-derived polymers, this study evaluates whether sponge-derived ECM polymers can develop scaffolds for 3D cultures of mammalian and invertebrate cells or if their structural features inspire novel biomaterial design.
ECM polymers were isolated from four marine sponge species: Chondrosia reniformis, Chondrilla nucula, Petrosia ficiformis, and Geodia cydonium, biochemically and ultrastructurally characterized, and 3D scaffolds produced through freeze-drying techniques. Additionally, decellularized scaffolds were obtained from the same species, Fig1. Finally, their effectiveness was evaluated in mammalian and invertebrate cell cultures.

Our findings indicate that C. reniformis and C. nucula possess ECMs with high collagen content, making them suitable for developing 3D matrices supporting cell adhesion in mammalian and marine invertebrate cell lines. In contrast, the decellularized structures of P. ficiformis and G. cydonium, due to their composite composition of polymers and biosilica, demonstrated enhanced performance in sustaining cell growth. These results highlight the potential of sponge-derived matrices for advanced biomaterial applications in regenerative medicine and in vitro cell culture models.
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Mots-Clés: Biomaterials, collagen, porifera, 3D scaffolds, biosilica, tissue engineering, biomimetic

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