Conductive Biohybrid Skeletal Muscle Tissue

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Abstract

Electrical stimulation (ES) has been successfully used in medicine for several applications, among them, ES is used to influence cells proliferation, migration, differentiation and self-healing. [1-3] However, it is highly challenging to transmit electrical signals to cells in 3D structures due to its limited electrical conductivity. Therefore, to overcome this drawback it has been reported that including conductive materials in tissue engineering enhanced the electrostatic interaction between cells and the substrate, improving ES effect. [4,5]
For that reason, we present a research project where a 3D printed tissue engineering has been growth in the presence of conductive polymer nanoparticles. More specifically, poly(3,4-ethylenedioxythiophene) nanoparticles (PEDOT NPS) were incorporated into a C2C12 mouse myoblast biohybrid skeletal muscle and incubated during 14 days. After time, the PEDOT NPS effect was studied trough morphological, chemical and biocompatibility evaluation. Meanwhile, the impact of ES in C2C12 muscle tissue, with and without PEDOT NPS, was evaluated by the contraction force from the biohybrid muscle stimulated with 10, 15 or 20 V. Results suggest that the incorporation of conductive nanoparticles did not affects C2C12 cells viability, while the contraction force increase between 23-48%, in comparison to the non-conductive system, leading to more efficient and stronger Biohybrid Skeletal Muscle Tissue, which are a fundamental element in Biohybrid Robotic Systems.

Keywords: 3D Bioprinting, conductive polymer, C2C12 mouse myoblast, skeletal muscle electrostimulation, …

References

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Figures

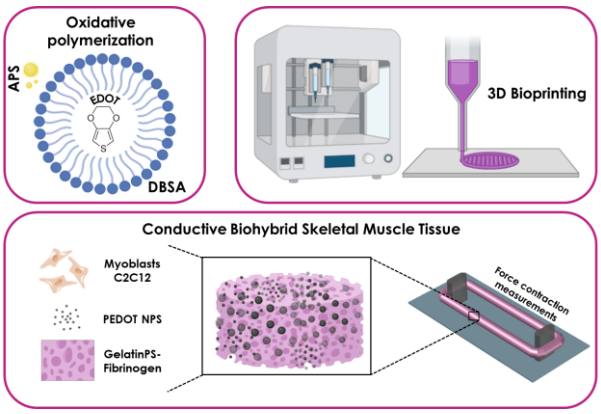

Figure 1. Schematic rout of the Conductive Biohybrid Skeletal Muscle Tissue synthesis.