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HUMAN ENDOTHELIAL CULTURE CELLS AND STERILIZATION WITH 3D PRINTED PCL AND PLA STENTS

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Abstract (300 words)

Biodegradable stents (BRS) were introduced to overcome the limitations of permanent stents, offering the potential to improve long-term patency rates by providing support just long enough for the artery to heal itself. Ideally, BRS should meet four requirements: a) BRS manufacturing process should be precise, fast, and economic, b) BRS degradation should not be toxic to the body, c) BRS degradation rate should match the recovery rate of vascular tissue, and d) BRS should induce rapid endothelialization. While the second and third requirements have been deeply studied the first and last requirement had been overlooked.

This work presents a novel 3D-Printed BRS made of Polycaprolactone (PCL) and Polylactide Acid (PLA). Authors aim to study effects of different sterilization methods over the stents properties and effects of stents material and geometry over the cell proliferation.

Three sterilization methods were applied such as Ethanol 70%, Ultraviolet Lamp and Antibiotic Sterilization. All treatments were performed for 0.5h, 1h, 8h and 16h. Supplemented Dulbecco's Modified Eagle's Medium (DMEM) with phenol red (pH indicator) and without penicillin/streptomycin was added after different treatments. Remaining infection was indicated by yellowing of the media and increased of media opacity. With regards to Ethanol treatment, all samples treated below 8 hours showed signs of infection, while samples treated during 8 and 16 hours exhibited a complete sterilization.

Therefore, subsequent chosen methodology for sterilization was Ethanol overnight and Ultraviolent Lamp 20 min. To elucidate cell behaviour on stent, sterilized parts were placed in non-adherent microplates and seeded with a final concentration of 40000 Human Umbilical Vein Endothelial Cells (HUVEC) per stent. Endothelial cell proliferation was tested by MTT assay. Results showed a strong influence of flow rate, number of cells and material over HUVEC growth ($p<0.05$), while stent cell geometry did not show significant influence.

Keywords — 3D Printing; Bioabsordable; Cell Adhesion; Endothelialization.

Professional Biography (100-150 words)

Paula Cano Calvo holds Bachelor degree in Biology from University of Girona. Her final project was *3D printed PCL and PLA stents sterilization and culture with human endothelial cells*. This project was done in the New Therapeutic Targets Laboratory Research Group (TargetsLab) – Oncology Unit in the Department of Medical Sciences and in the Product, Process and Production Engineering Research Group (GREP) in the Department of Mechanical Engineering and Industrial Construction, both research units from University of Girona. She also performed extracurricular practises in TargetsLab where her research was focused on three-dimensional breast cancer cell culture in 3D matrices and mammospheres generation.



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