3D PRINTING OF SOLID-LIQUID COMPOSITES FOR CELL-LIKE BASED ARTIFICIAL SKIN MODEL

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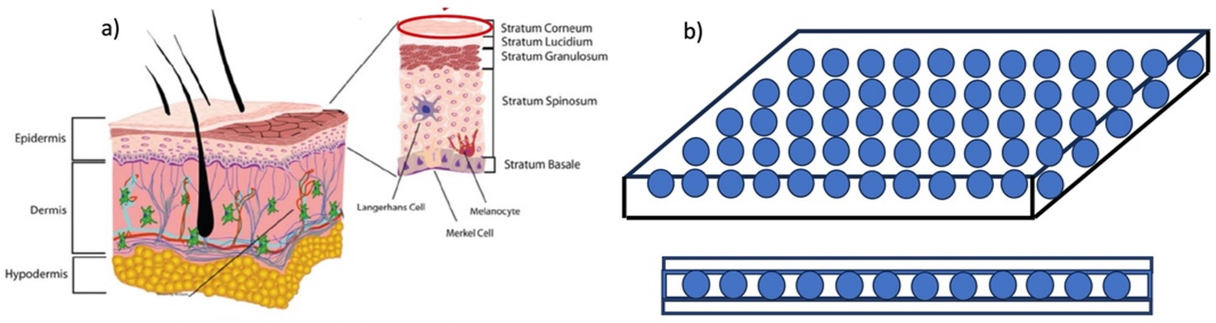
INTRODUCTION / CONCEPT

Artificial skin models have become increasingly important in biomedical research. In recent years, 3D printing technology has emerged as a powerful tool for the fabrication of complex, biomimetic skin models. To address this challenge, researchers are exploring the use of solid-liquid composites in 3D printing to create more realistic and functional skin models.

This work presents a 3D printing-based approach to create a cell-like based artificial skin model using a solid-liquid composite material (SLC). The composite material is composed of a flexible polymeric matrix (polydimethylsiloxane) and a liquid substance (glycerol with blue dye). The flexible matrix provides structural support and stability, while the liquid substance mimics the presence of cells into the skin, providing an additional mechanical flexibility to the silicon-based material (Fig. 1).



histological representation of skin

Figure 1: Illustration of the concept

METHODOLOGY

3D PRITINTING PROCESS (Fig. 2)

- **Design and fabrication of a mold;**
- **Deposition of the PDMS pre-layer;**
- **Deposition of the liquid PDMS polymer;**
- **3D Bio printing of the liquid droplets before crosslinking (solidification);**
- **Application of a PDMS post-layer;**
- **Demolding – Obtention of the SLC for mechanical characterization (Fig. 3).**

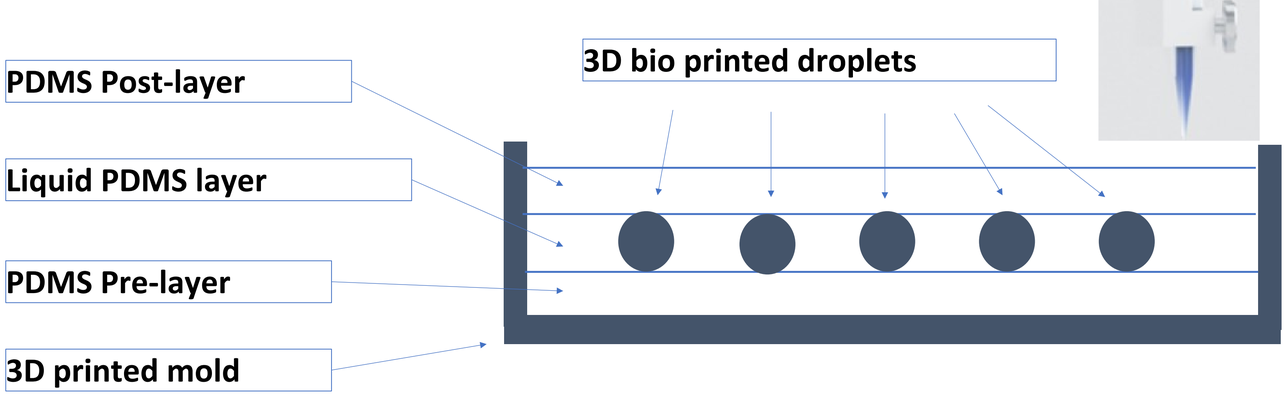


Figure 2: Illustration of the 3D printing process [1]

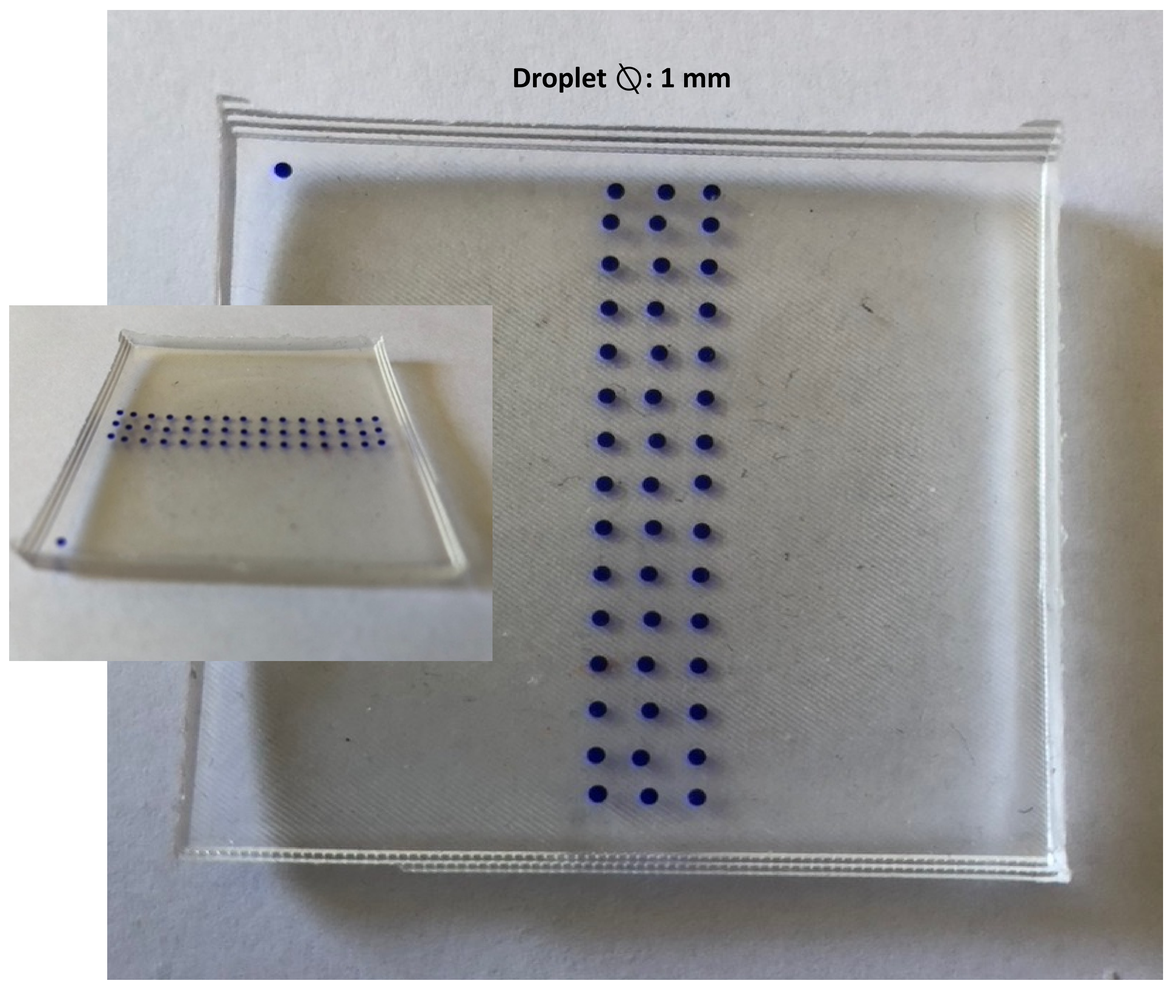
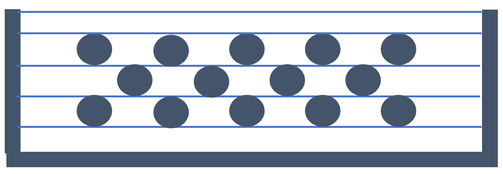


Figure 3: Illustration of the solid-liquid composites

MULTILAYERED SOLID-LIQUID COMPOSITES

3D Printing of multilayered solid-liquid composites (Fig. 4)



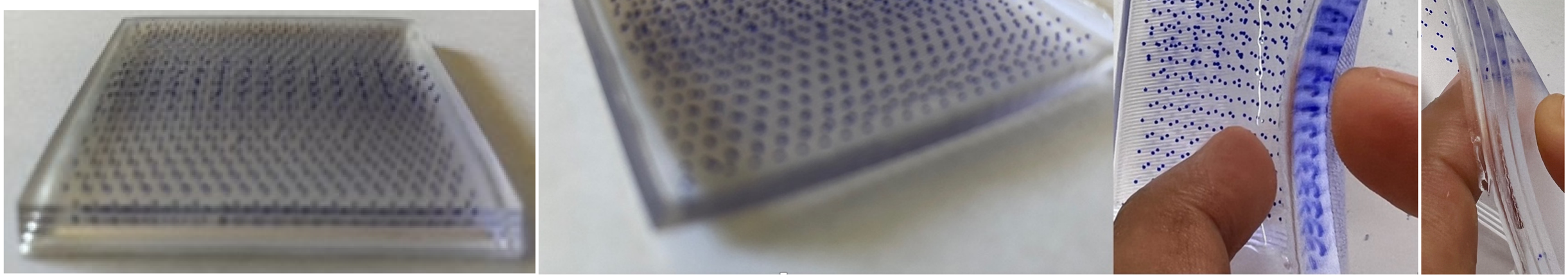


Figure 4: Illustrations of multilayered cell-like based artificial skin models obtained via 3D printing of solid-liquid composites.

PERSPECTIVES

- **Characterization and design of the mechanical properties of the artificial skin models [2].**
- **Investigation of durotaxis, i.e. cell migration due to stiffness gradients (Fig. 5).**

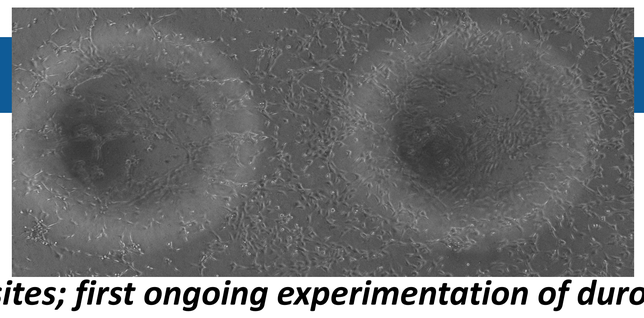


Figure 5: Cells on solid-liquid composites; first ongoing experimentation of durotaxis

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