



Drug-loaded PLGAs for 3D printed wound-healing patches using DMSO as the solvent

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I. Introduction

With the aim of advancing the field of wound-healing and personalized medicine, this research project is designed to test and optimize the synthesis of a PLGA/DMSO gel loaded with quercetin, a controlled release drug. These tests will inform a subsequent Ignite 22/23 project, which will 3D-print the PLGA/DMSO gel to fabricate wound-healing patches.

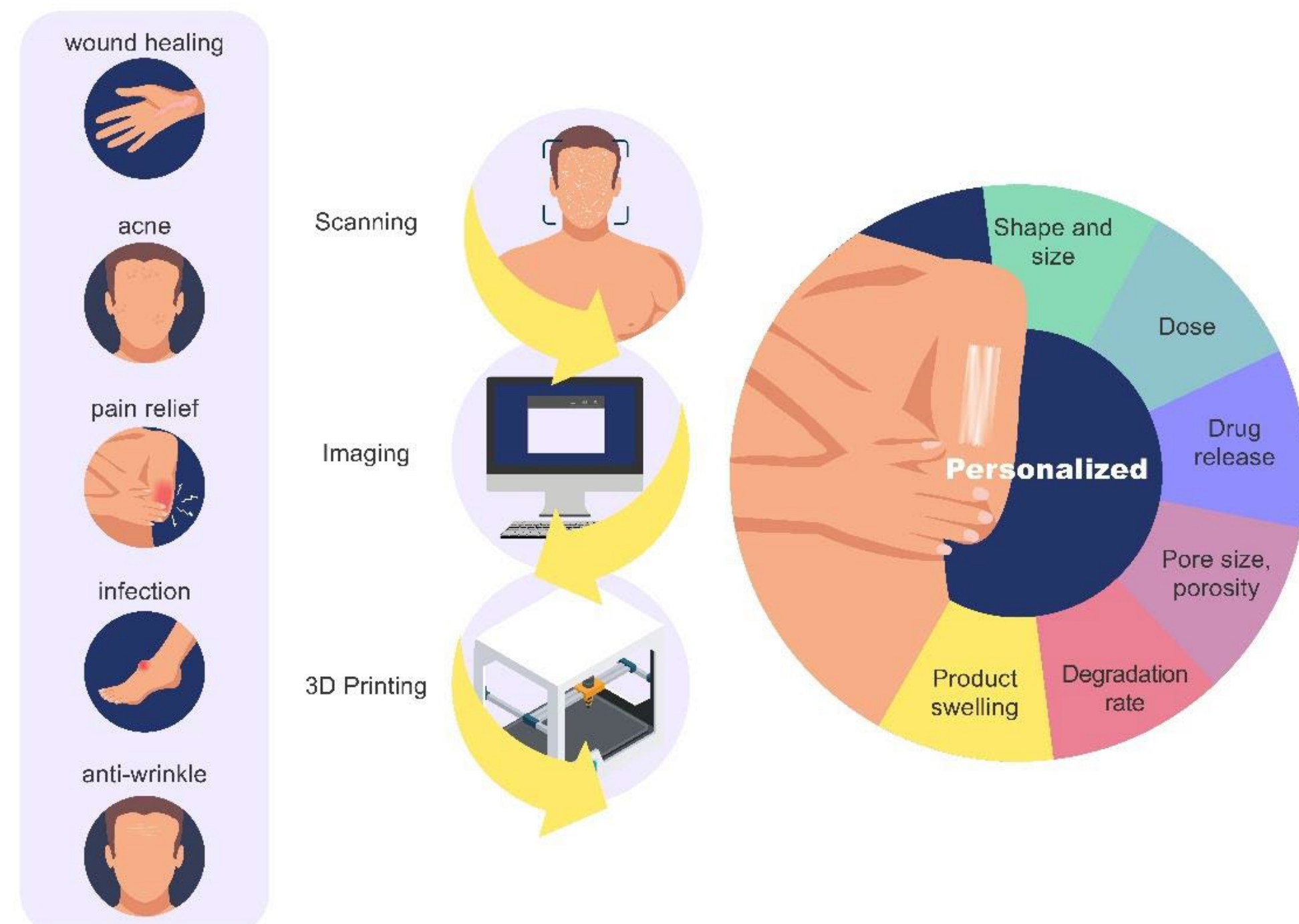


Fig 1: Main advantages of 3D-printed topical skin products for transdermal drug delivery and personalized medicine

II. Transdermal Drug Delivery (TDD)

Advantages:

- Non-invasive and decreased risk of infection
- Preferred by patients
- Customizable

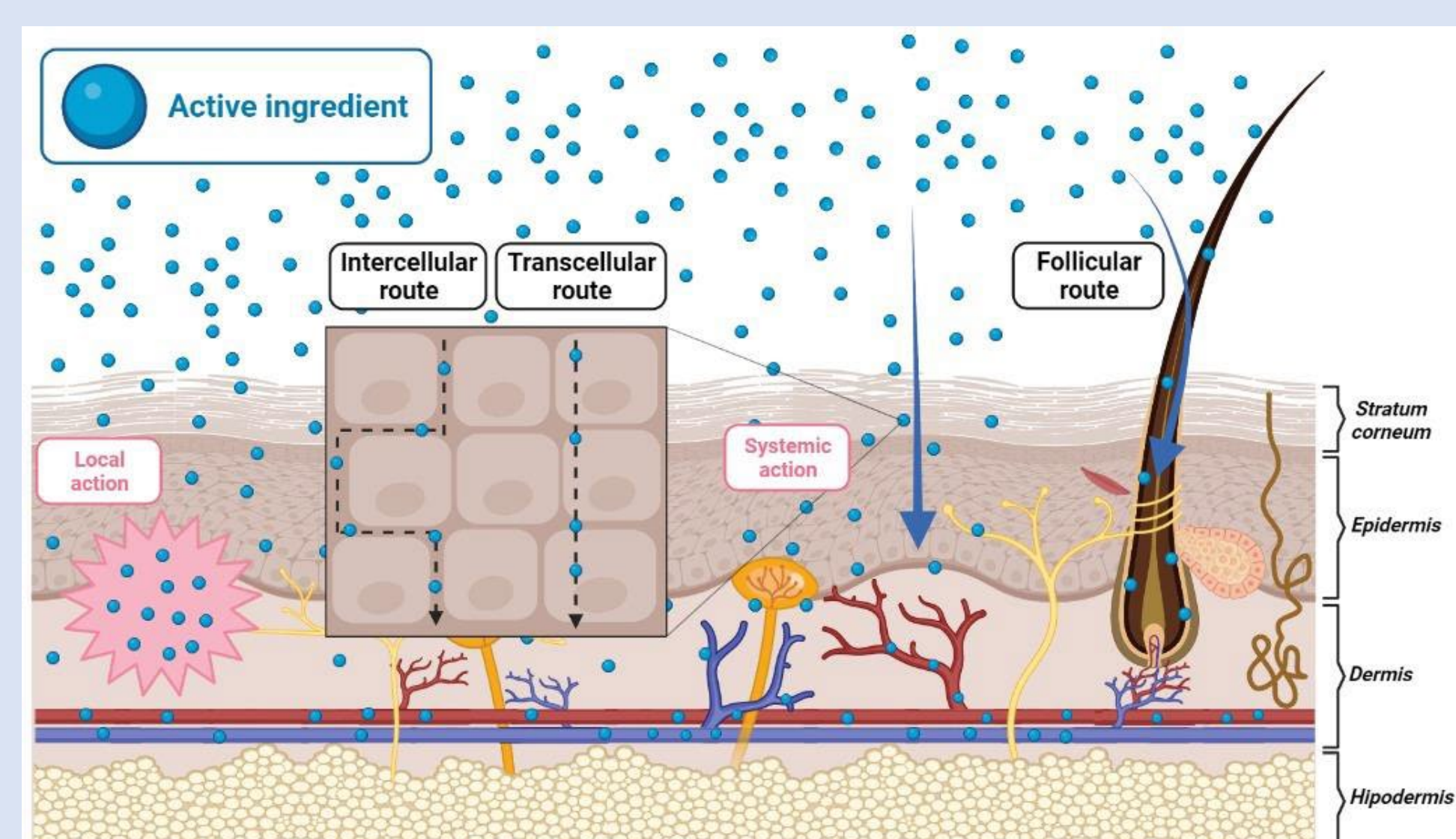


Fig 2: Schematic image of routes of transdermal drug delivery

III. Materials and Methods

The solution was synthesized by mixing 85:15 PLGA with DMSO and Quercetin, according to the following ratios of PLGA/DMSO:

- 1 mg PLGA/mL DMSO
- 2 mg PLGA/mL DMSO
- 250 mg PLGA/mL DMSO
- 500 mg PLGA/mL DMSO

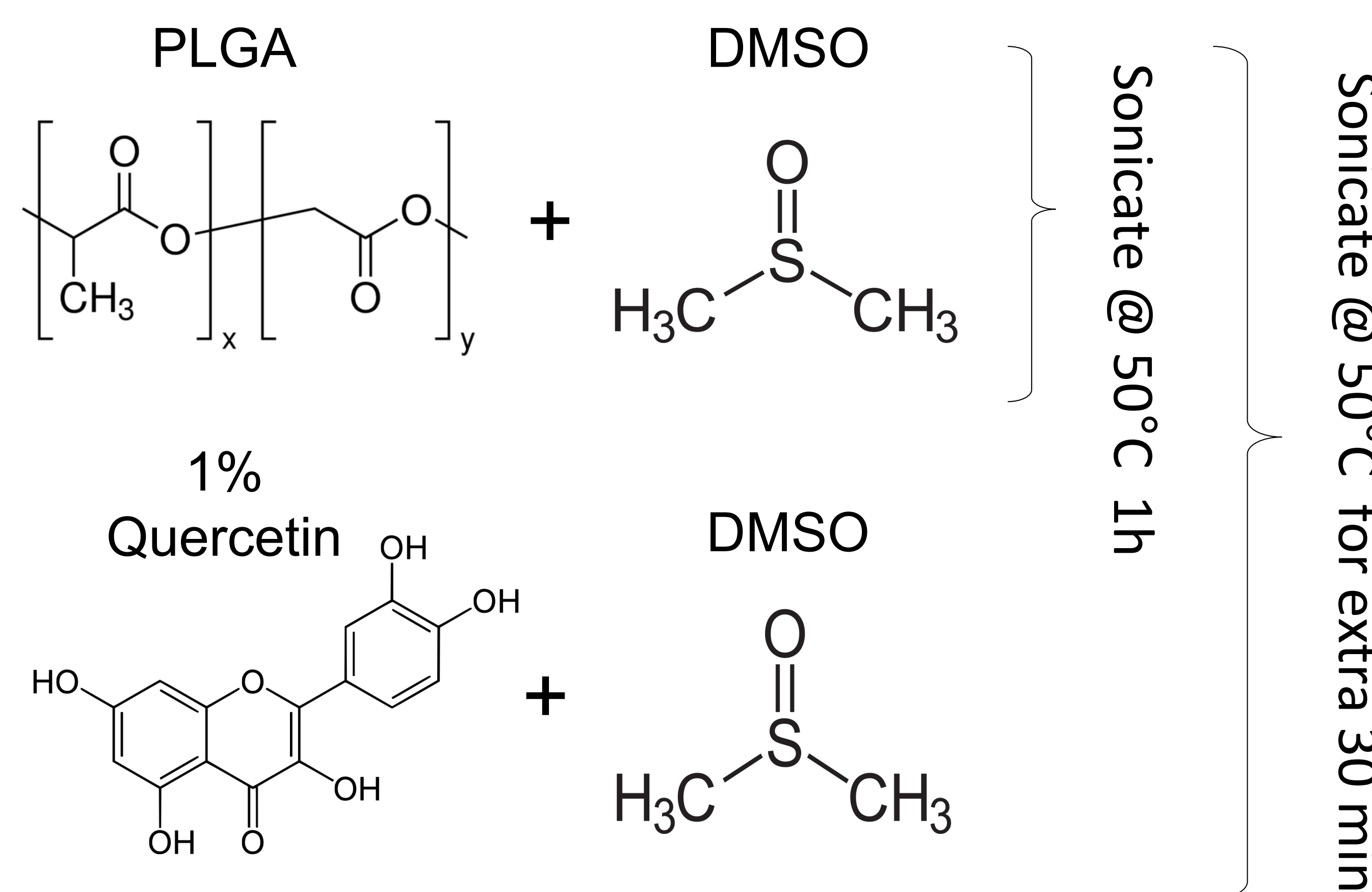
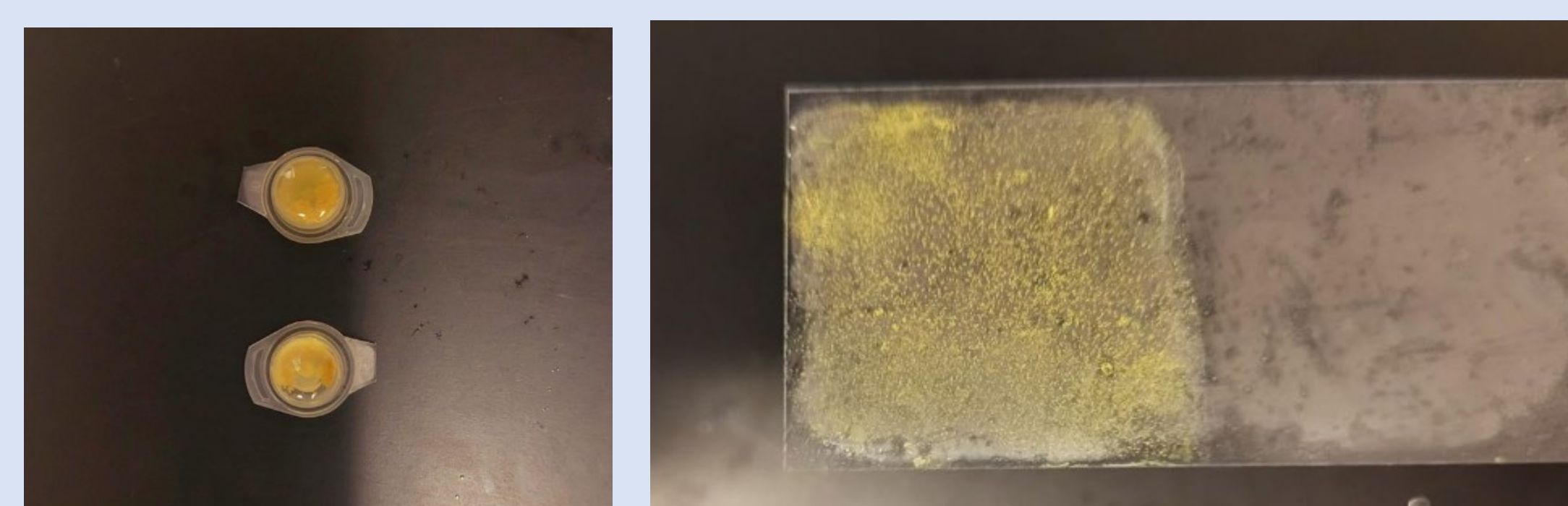


Fig 3: (left) top sample is 250 mg PLGA/mL DMSO and bottom sample 500 mg PLGA/mL DMSO were the only samples that showed partial solidification at -10°C.

Fig 4: (right) thin film of dip-coated 500 mg PLGA/mL DMSO with 1% Quercetin



IV. Results

Goal: Survey properties of PLGA/DMSO for 3D-printing applications

- 85:15 and 90:10 LA:PA ratios of PLGA
- high molecular weight PLGA
- high PLGA/DMSO ratio (over 500 mg/mL)

V. Future Applications:

Step 1 – Determine concentration of PLGA:DMSO that solidifies at -4°C for 3D printing

Step 2 – 3D printing of PLGA:DMSO solution with parallel and crosshatch patterns

Step 3 – Characterization of the 3D printed patches

Step 4 – Controlled drug-release testing

VI. References

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