UNPRECEDENTED PHOTOLITHOGRAPHIC STRUCTURING OF NOVEL LIGHT-SENSITIVE POLY(AMINO ACID) MATERIALS

Current implantable medical devices are challenged by the device/tissue biocompatibility and safety of the materials used to make the device, resulting in medical complications in patients. POLINA's new key enabling technology will give a leading edge to underpin the set-up of an entirely new biolithographic industry and unlock new biomedical devices design for safe, personalised healthcare products.

POLINA is an EIC Pathfinder Open project that aims to revolutionise the field of biocompatible materials by adapting high-resolution photolithography technologies for high-precision geometrical structuring of natural amino acids, surpassing the resolution limitations of gold-standard extrusion processes.

POLINA pioneers an innovative photobase chemical route for fabrication of patterned poly(amino acid) (PAA)-based materials, similar to the negative photoresist technology in the semiconductor industry. With this technology, POLINA aims to combine novel, light-sensitive amino acid materials with industrially established and emerging photolithographic techniques, to produce the next-generation macro- and micro-structured materials for medical devices.

POLINA's disruptive approach will be explored in the proof-of-concept manufacture of three micro-to-macroscale platforms:

- **Micropatterned PAA surfaces for 2D cell culture**
- **PAA multi-well platforms to generate lung spheroids for drug screening**
- **Macroscale ex vivo tracheal implants functionalized with cell-adherent peptide motifs**

POLINA

Programme:
HORIZON-EIC-2023-PATHFINDEROPEN-01

Duration:
01.01.2024 – 31.12.2027

Budget:
2.88 million euro

OUR CONCEPT

New chemistry & materials

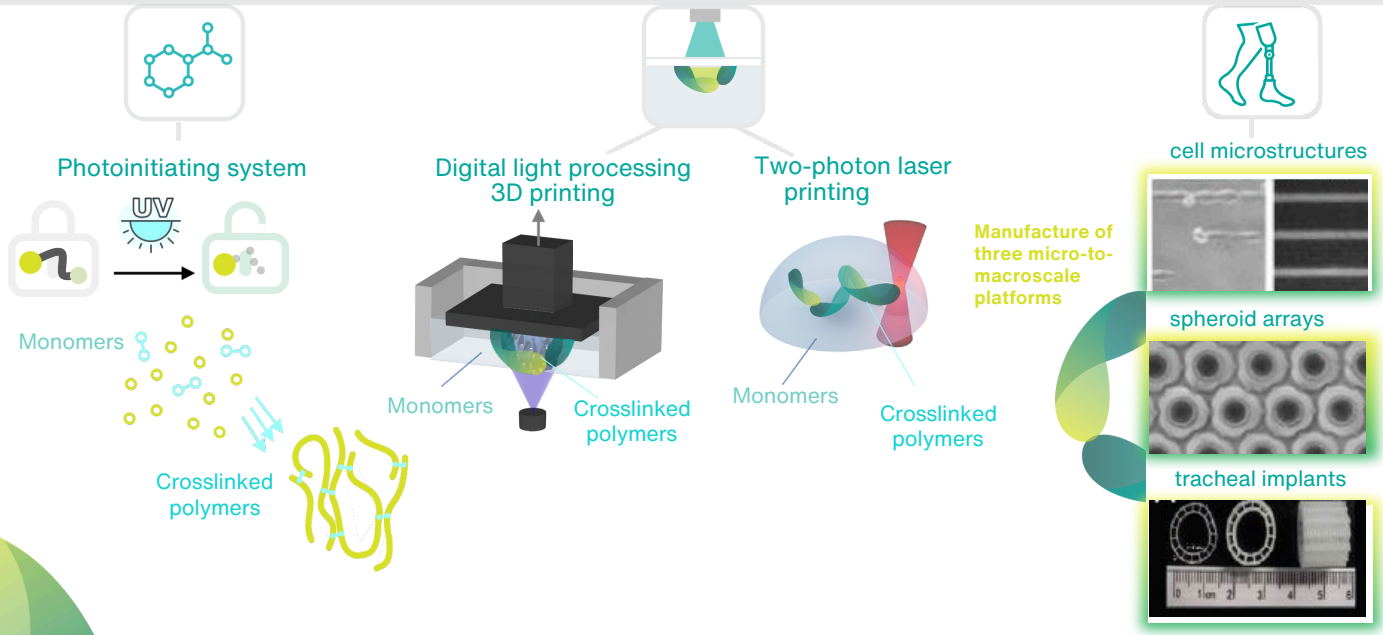
Establishing a series of novel, light-sensitive amino acids

Photopolymerisation processes

Optimising and demonstrating its suitability for photolithographic patterning and scaffold printing

2D & 3D lithographic printing

Cutting-edge printing outcomes for biomedical applications



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POLINA

ACTIVITIES

The first two WPs have started simultaneously, establishing a series of novel, light-sensitive amino acid materials and optimisation of a photopolymerisation process (WP1) and demonstrating its suitability for photolithographic patterning and scaffold printing (WP2). Starting in year 2 of the project, WP3 will focus on the proof-of-concept of PAA structures into medical devices and tools, as well as their performance evaluation. WP4 and WP5 will proceed continuously for the entire project duration to ensure its smooth running and effective communication of its results.

IMPACT

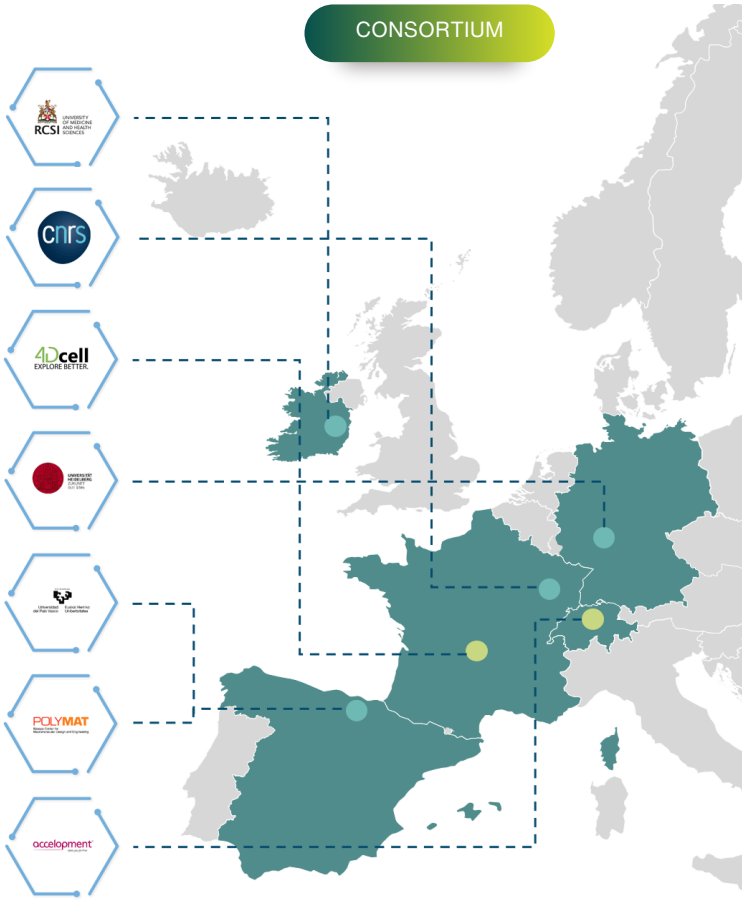
POLINA will merge the fields of **photolithography**, which has demonstrated exceptional value in the semiconductor industry, and nature-inspired PAA biomaterials that will solve current unmet sustainable medical devices challenges.

POLINA's new biomaterials have exceptional societal and economic potential by replacing the non-degradable polyacrylates with green PAAs for safer and more efficient medical implantable devices and reduction of health care costs for patients.

"POLINA uniquely draws on fundamental science and advanced processing technology to deliver clinically translatable impact"

Prof. Andreas Heise
Project Coordinator, Professor at RCSI
and Head of the polymer chemistry group

CONSORTIUM



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