ERC Starting Grant 2018
Research proposal [Part B1][1]
(Part B1 is evaluated both in Step 1 and Step 2, Part B2 is evaluated in Step 2 only)

Bioengineering lung tissue using extracellular matrix based 3D bioprinting

3DBIOLUNG

Cover Page:
Name of the Principal Investigator (PI): Darcy Elizabeth Wagner
Name of the PI's host institution for the project: Lund University
Proposal duration in months: 60 months

Chronic lung diseases are increasing in prevalence with over 65 million patients worldwide. Lung transplantation remains the only potential option at end-stage disease. Around 4000 patients receive lung transplants annually with more awaiting transplantation, including 1000 patients in Europe. New options to increase available tissue for lung transplantation are desperately needed.

An exciting new research area focuses on generating lung tissue *ex vivo* using bioengineering approaches. Scaffolds can be generated from synthetic or biologically-derived (acellular) materials, seeded with cells and grown in a bioreactor prior to transplantation. Ideally, scaffolds would be seeded with cells derived from the transplant recipient, thus obviating the need for long-term immunosuppression. However, functional regeneration has yet to be achieved. New advances in 3D printing and 3D bioprinting (when cells are printed) indicate that this once thought of science-fiction concept might finally be mature enough for complex tissues, including lung. 3D bioprinting addresses a number of concerns identified in previous approaches, such as a) patient heterogeneity in acellular human scaffolds, b) anatomical differences in xenogeneic sources, c) lack of biological cues on synthetic materials and d) difficulty in manufacturing the complex lung architecture. 3D bioprinting could be a reproducible, scalable, and controllable approach for generating functional lung tissue.

The aim of this proposal is to use custom 3D bioprinters to generate constructs mimicking lung tissue using an innovative approach combining primary cells, the engineering reproducibility of synthetic materials, and the biologically conductive properties of acellular lung (hybrid). We will 3D bioprint hybrid murine and human lung tissue models and test gas exchange, angiogenesis and *in vivo* immune responses. This proposal will be a critical first step in demonstrating feasibility of 3D bioprinting lung tissue.

[1] Instructions for completing Part B1 can be found in the '*Information for Applicants to the Starting and Consolidator Grant 2018 Calls*'.