# *IN VITRO* EVALUATION OF THREE-DIMENSIONAL PRINTED THERMOPLASTIC POLYURETHANE AND POLYLACTIC ACID SCAFFOLD FOR TRACHEAL TISSUE ENGINEERING

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## Introduction

Biocompatible polymers such as thermoplastic polyurethane (TPU) and polylactic acid (PLA) are frequently employed in biomedical applications[1,2]. For application in tracheal tissue engineering, TPU and PLA composites were melt blended and three-dimensionally (3D) printed. It is predicted that the scaffold can provide an optimum environment and act as a vital physical substrate for cell attachment and proliferation.

## Objectives

To evaluate the viability and attachment of human bronchial epithelial (BEAS2B) cells towards the 3D-printed TPU/PLA scaffolds in cell culture experiments.

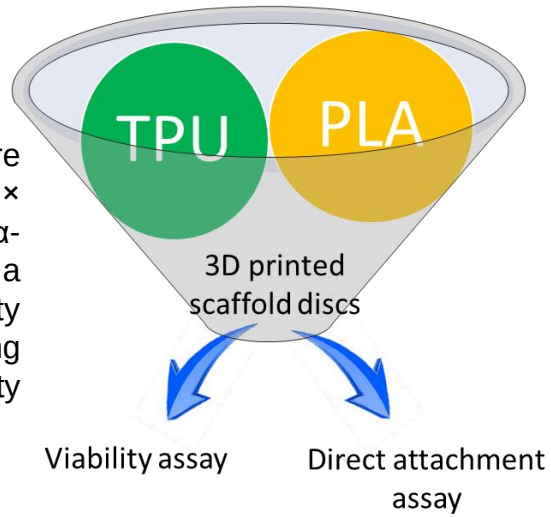
## Methods

**1. Preparation of the scaffold**

TPU and PLA pellets were melt blended to produce filament; 3D printed in disc-shaped scaffold

**2. Viability assay**

The BEAS2B cells were seeded at a density of 1 × $10^4$ cells/well with fresh α-MEM was used as a positive control. The toxicity test was performed using Presto Blue Cell Viability Reagent™.

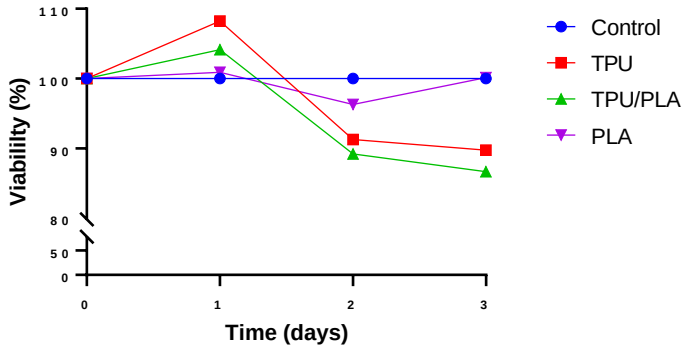


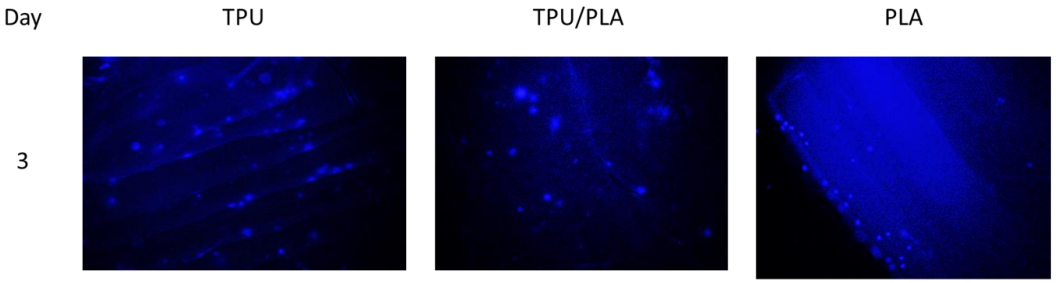

**3. Direct attachment assay**

Hoescht 33342 was used to stain the cells and viewed under a fluorescent microscope.

## Results

The viability of BEAS-2B was greater than 80% in all compositions up until day 3 and significantly different between types of material (p-value < 0.001). It is indicated that none of the compositions was toxic to the cells.




The BEAS2B cells were attached to the surfaces of all types of the scaffold and inside the porous scaffolds when seen under the fluorescent microscope.

## Conclusion

The BEAS-2B cells were nontoxic to the 3D printed TPU/PLA scaffold, indicating that the composite is biocompatible and has the potential to be utilised in tissue engineering applications.

## References

1. Wendels, S. and Avérous, L. (2021) 'Biobased polyurethanes for biomedical applications', Bioactive Materials, 6(4), pp. 1083–1106.
2. Saini, P., Arora, M. and Kumar, M. N. V. R. (2016) 'Poly(lactic acid) blends in biomedical applications', Advanced Drug Delivery Reviews, 107, pp. 47–59.