FRICTIONAL COEFFICIENTS OF LIVING VASCULAR CELL MONOLAYERS

E. R. Clark [a*], K.E Porter[b], M. G. Bryant[a]
*e.r.clark@leeds.ac.uk
[a]Institute of Functional Surfaces, School of Mechanical Engineering,
University of Leeds, UK
[b] Leeds Institute of Cardiovascular and Metabolic Medicine,
University of Leeds, UK

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ABSTRACT
Advancements in the field of biotribology have generated considerable interest in the frictional properties of cells. The nature of the interface between biomaterial and living tissue is especially pertinent from a medical device perspective.

Annually, there are 800,000 vascular stents implanted into coronary arteries alone, with rising numbers due to the global burden of cardiovascular disease and Type 2 diabetes (1). The most prevalent cause of death in diabetic patients is a cardiovascular event, accounting for half of total diabetic deaths (2).

Currently, further work is needed to understand the effect of tribological interactions during stent deployment on cell response. Excessive forces enacting upon mechanically reactive cells may eventually result in failure of the stent via cell-mediated in-stent restenosis (ISR) (3-5).

Human primary smooth muscle cell (SMC) monolayers from non-diabetic (ND) and Type 2 diabetic (T2D) patients were isolated and cultured. Triplicate friction measurements of 0.5mN and 100µm sliding distance at 50 Hz were recorded for 20 cycles using a 2mm ruby pin.

A load of 1mN, the wear track and a denuded area of cells was visible. At a load of 0.5mN the SMCs remained adhered to the tissue culture plate. There was a significantly higher coefficient of friction in SMCs from diabetic patients compared to non-diabetic patients (0.45±0.009 vs. 0.37±0.018, ND vs. T2D, mean ± 95% confidence intervals, p<0.001) (*Figure 1*).

Further work will include equating tribological parameters, such as friction and load, with biological effects including cell viability, gene and protein expression and adverse vascular cell function in the context of ISR.

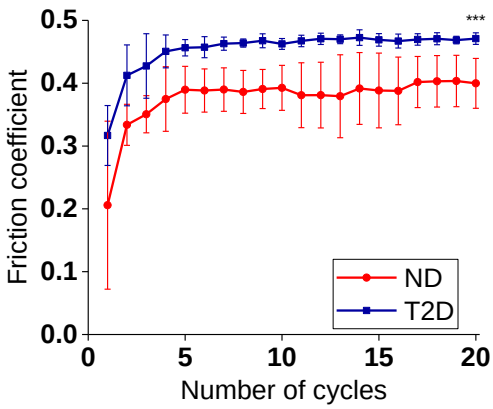

Figure 1Significantlyincreasedfrictional coefficient of T2D-SMCs vs. ND-SMCs, ***p<0.001

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