Substrate viscoelasticity affects human macrophage morphology and phagocytosis

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Supplemental Information

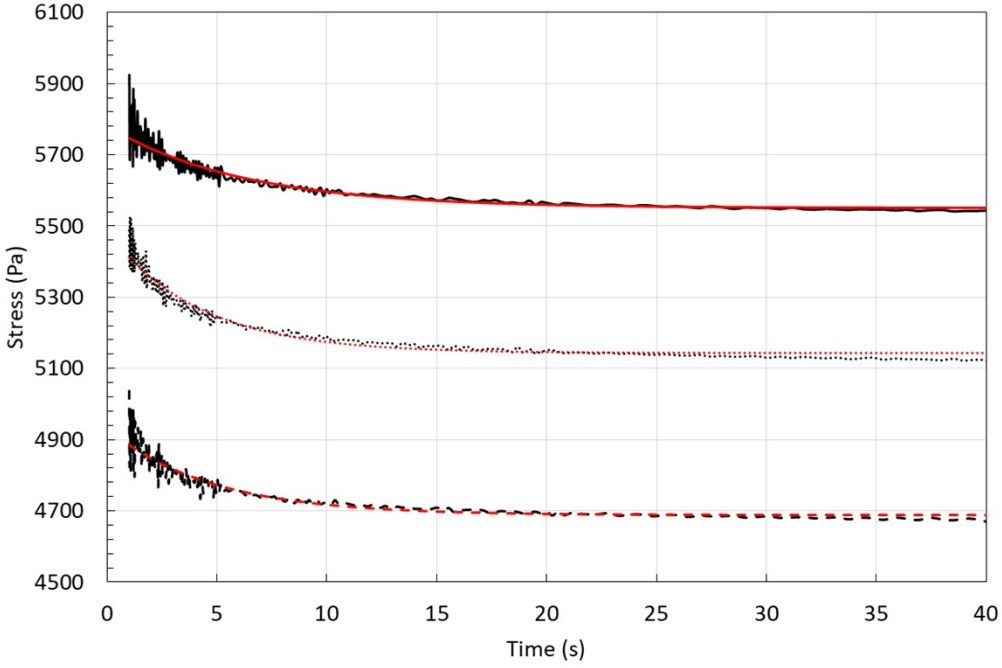


Figure S1. Characteristic stress relaxation curves for selected samples spanning our vPAA substrate formulations. Stress relaxation measurements were performed following the procedure previously used by Swoger et al.[1] by polymerizing a sample, placing it on the rheometer, and applying a constant shear strain of 5%, and measuring time-dependent shear stress. Stress relaxation times were obtained by fitting the data to an arbitrary exponential function, $\sigma(t) = A\, e^{\frac{-(t-B)}{\tau}} + C$, where τ is the characteristic stress relaxation time (black dots = collected data; red lines = fit). Stress relaxation time values (reported in Supplemental table S1) ranged from 6.19s (base formulation) to 4.19s (+3% linear PAA), which we anticipate to match with the expected frequency of cellular motion in native matrices [2].

Supplemental Table S1.

vPAA formulation	Characteristic stress relaxation time τ (s)
Base	6.186
+2% linear PAA	4.715
+3% linear PAA	4.192

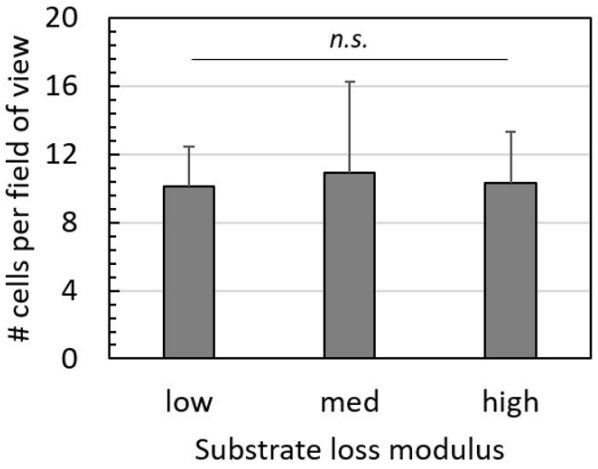
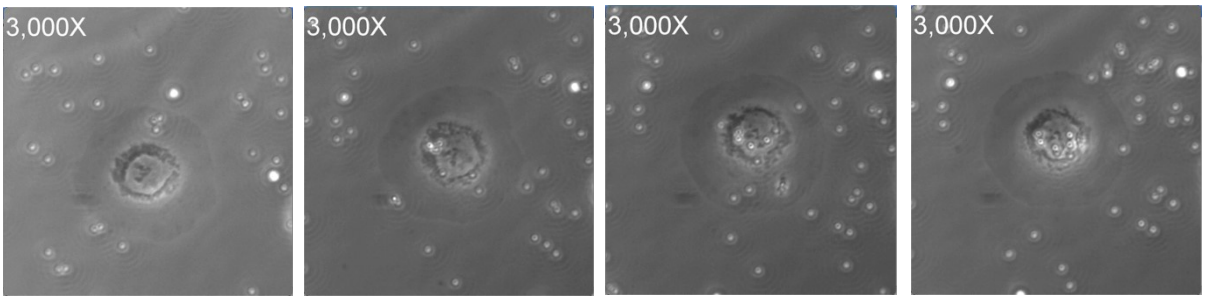


Figure S2. Number of cells per experimental viewfield across vPAA substrate formulations. Data confirms that no significant differences (n.s) were observed between substrates.



Supplementary Movie S1. Frames from a sample macrophage phagocytosis assay demonstrating that attached beads are each drawn towards the cell body during the phagocytosis process.

Supplementary References

[1] M. Swoger, S. Gupta, E.E. Charrier, M. Bates, H. Hehnly, A.E. Patteson, Vimentin Intermediate Filaments Mediate Cell Morphology on Viscoelastic Substrates, ACS Appl. Bio Mater. 5 (2022) 552–561. https://doi.org/10.1021/acsabm.1c01046.

[2] C. Rivat, C. Sar, I. Mechaly, J.-P. Leyris, L. Diouloufet, C. Sonrier, Y. Philipson, O. Lucas, S. Mallié, A. Jouvenel, A. Tassou, H. Haton, S. Venteo, J.-P. Pin, E. Trinquet, F. Charrier-Savournin, A. Mezghrani, W. Joly, J. Mion, M. Schmitt, A. Pattyn, F. Marmigère, P. Sokoloff, P. Carroll, D. Rognan, J. Valmier, Inhibition of neuronal FLT3 receptor tyrosine kinase alleviates peripheral neuropathic pain in mice, Nat. Commun. 9 (2018) 1042. https://doi.org/10.1038/s41467-018-03496-2.