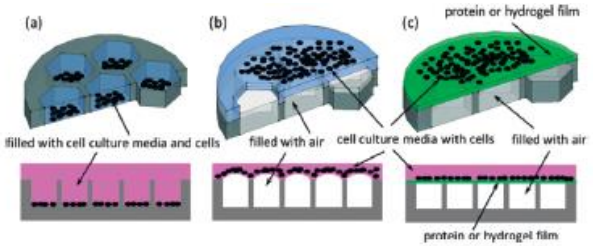
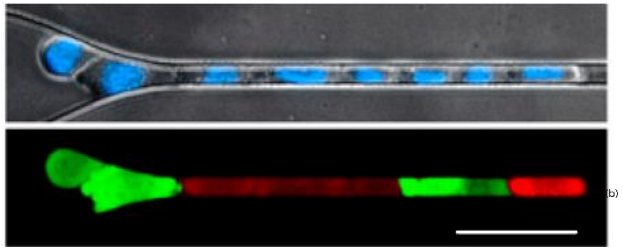
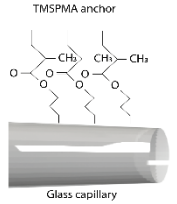
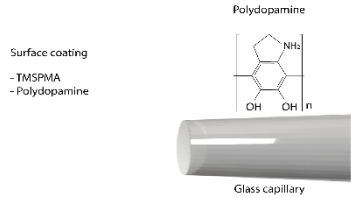
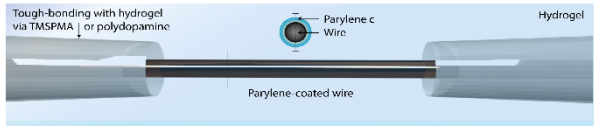
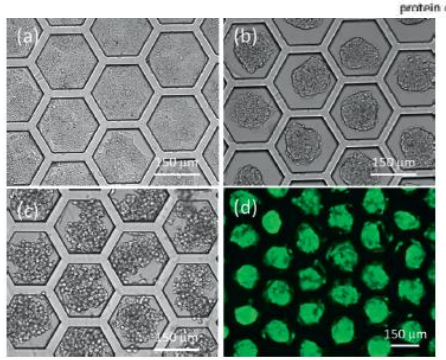








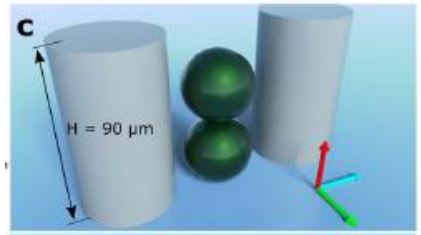


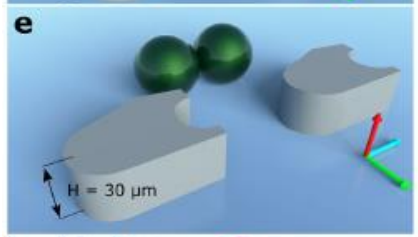


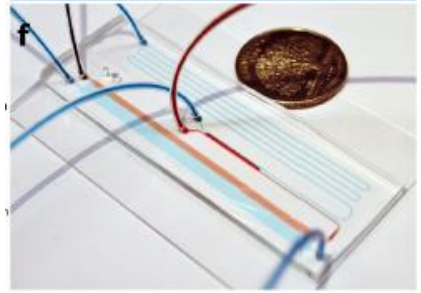
Microfluidics in Cancer Research

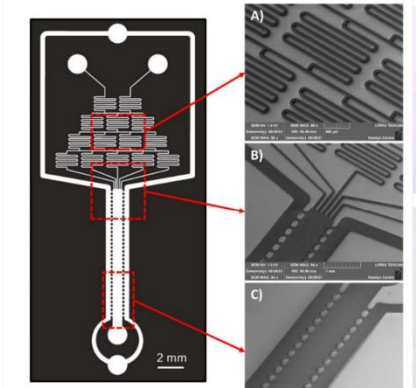
Sam Au, Lecturer, Bioengineering

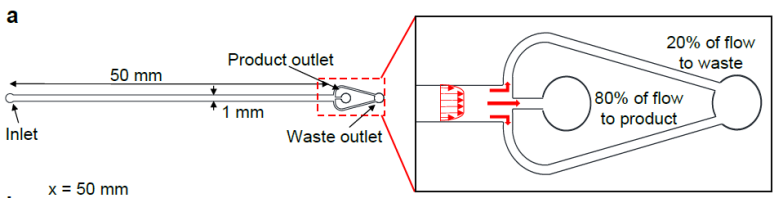
Imperial College London

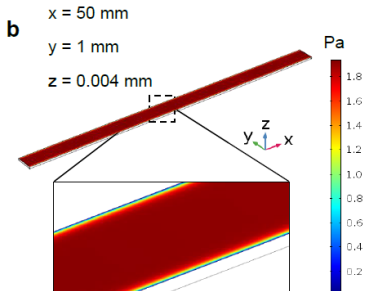


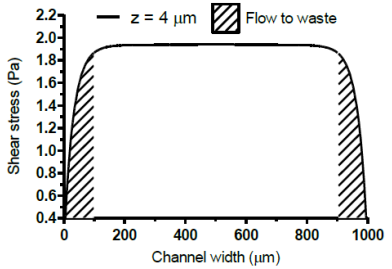


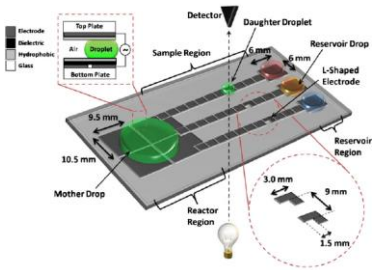












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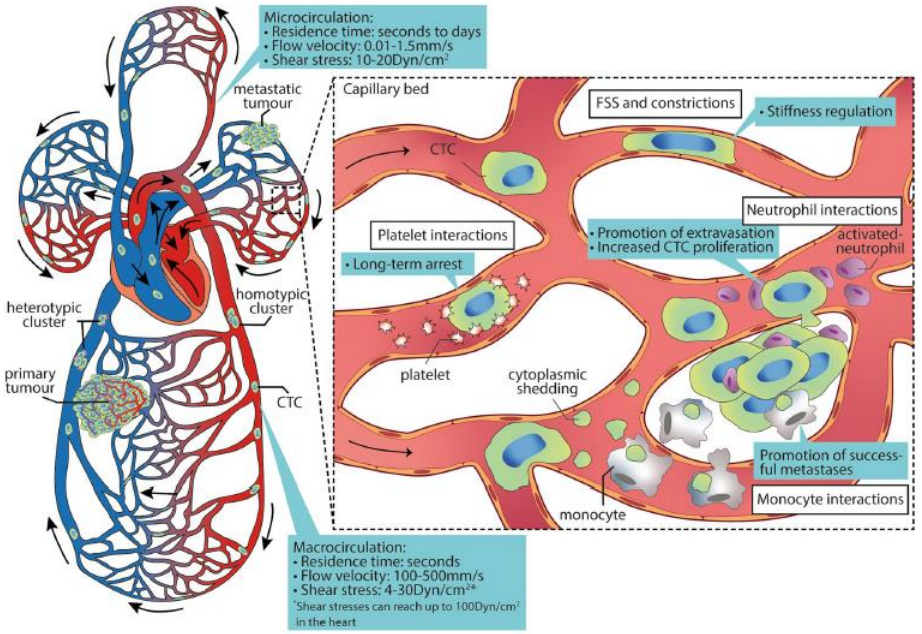
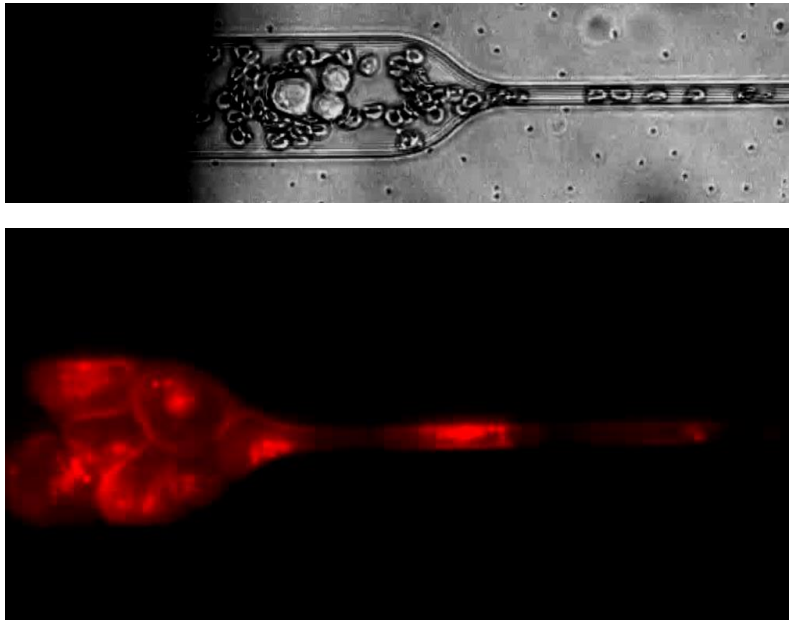
Metastasis

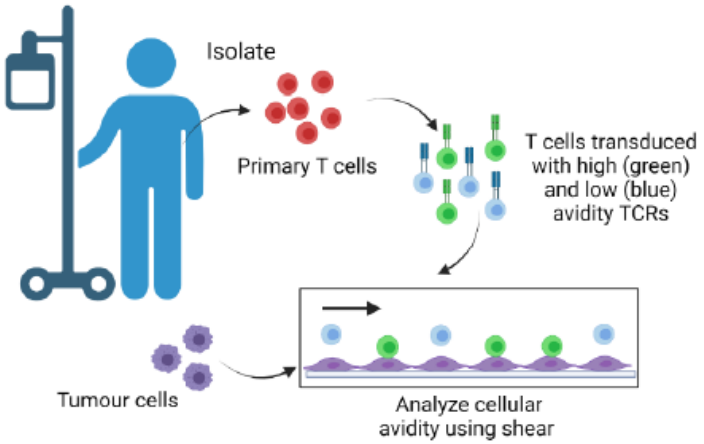


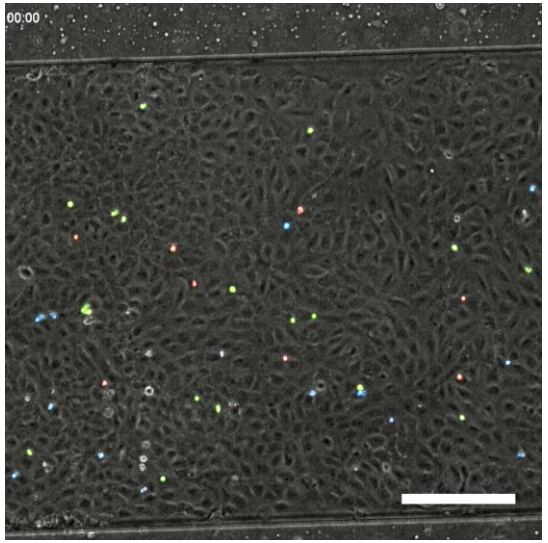
Vrynas, Paizal, Bakal & Au *Clin. & Exp. Met.* 2021



Au et al. *PNAS* 2016

Drug Screening & Immunotherapy

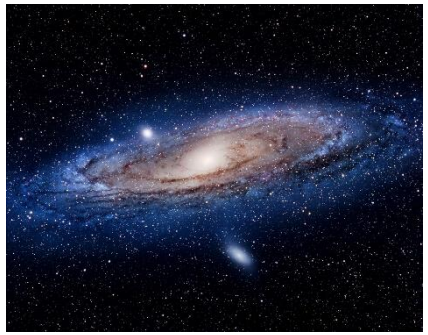




Ashby et al. *Advanced Healthcare Materials* In Press

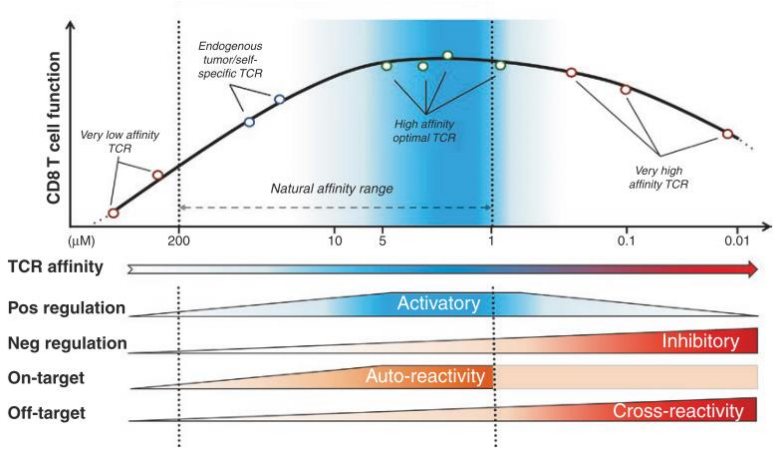
Microfluidic T Cell Selection by Cellular Avidity

TCR selection is challenging



Nearly 1 trillion distinct TCRs in humans

Binding strength “Avidity” may aid selection of TCRs that provoke optimal immune responses

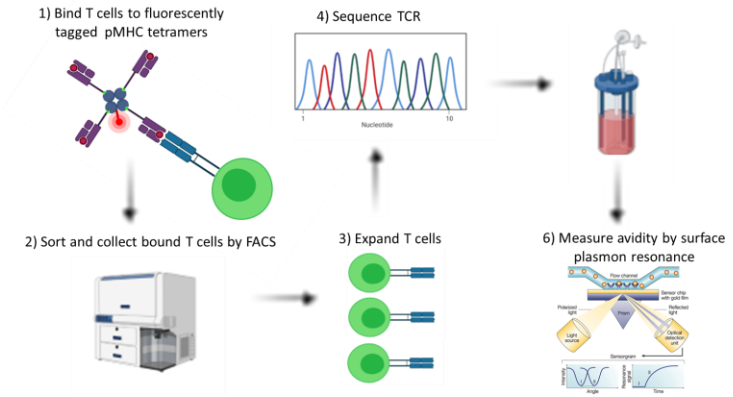


Schmid et al. *J. Immunology* 2017

Julian Ashby (Imperial)

Li Tang (EPFL)

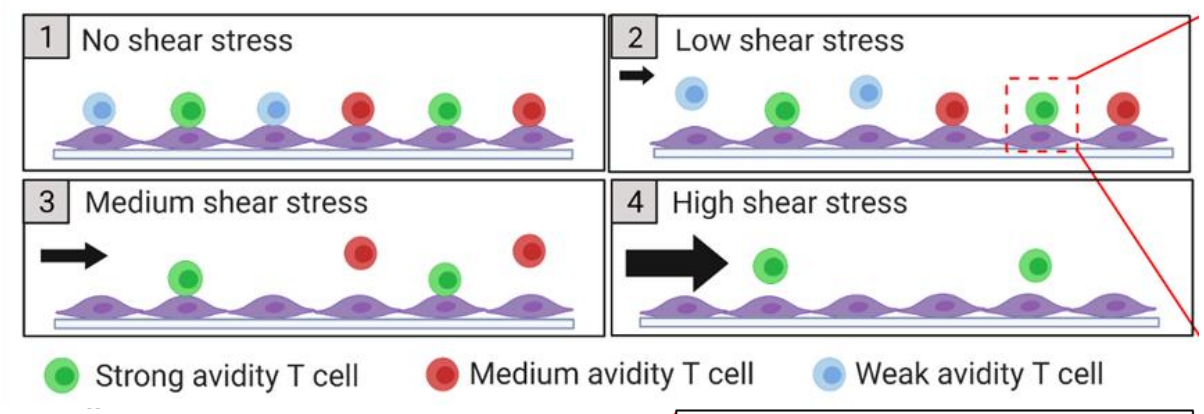
Current methods are inefficient & not cell-cell



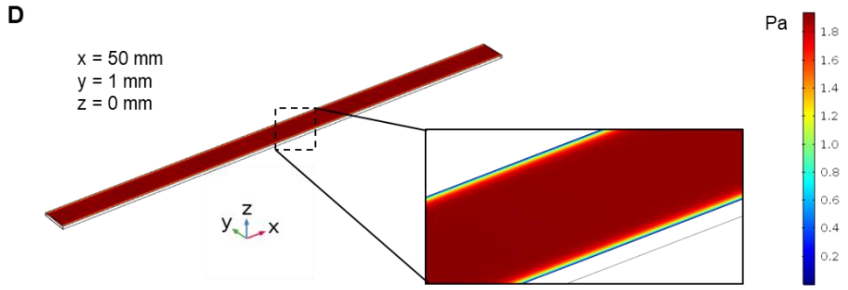
Julien Schmidt/Alexandre Harari (CHUV – Lausanne)

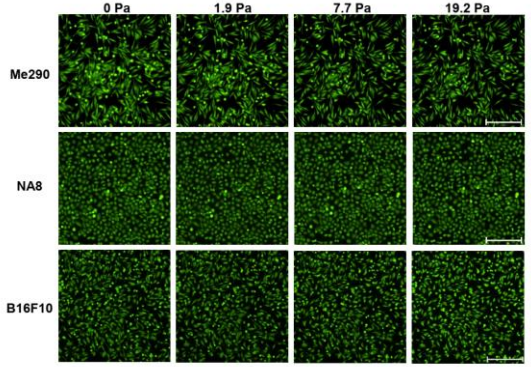
Can Microfluidics Accelerate T Cell Selection in Solid Tumours?

Fluid Shear Stress Based Selection

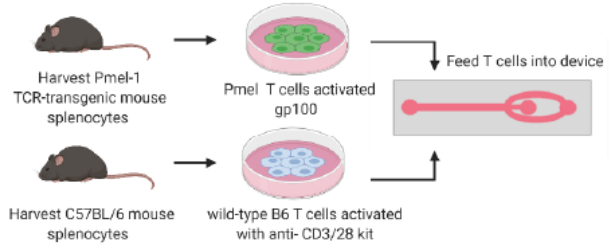


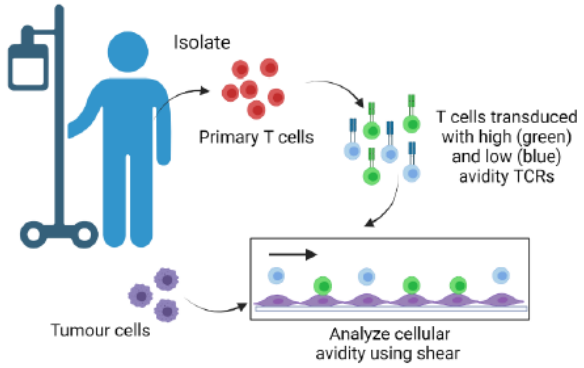
Requires: ~Uniform Shear Stress Distribution & Strong Tumour Cell Adhesion

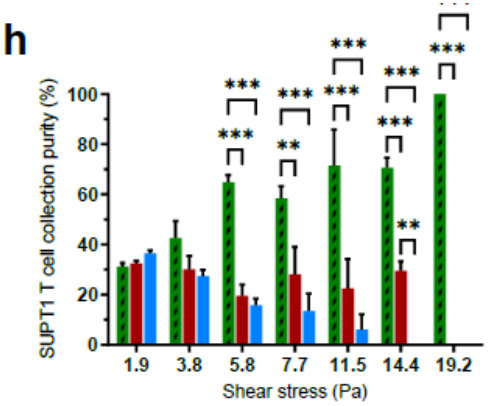


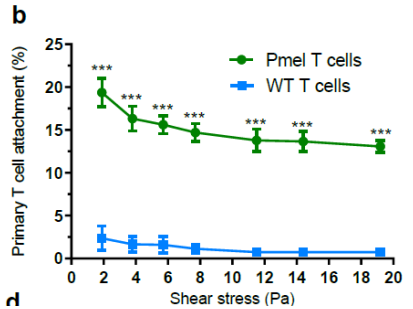


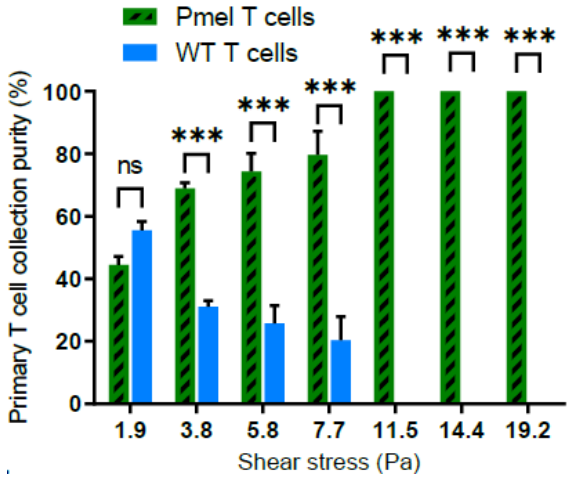
Collects high avidity T cells w/ up to 100% Purity



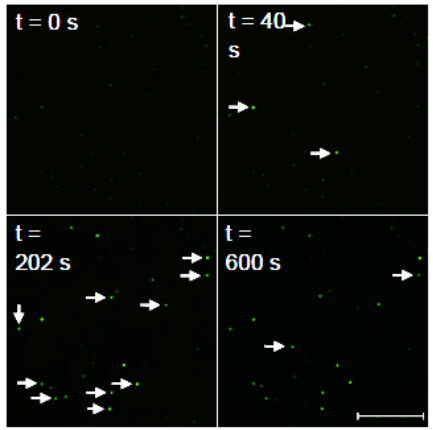


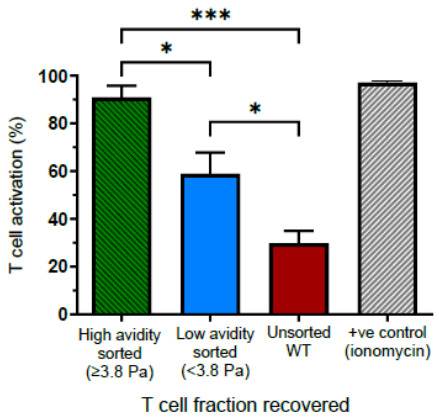


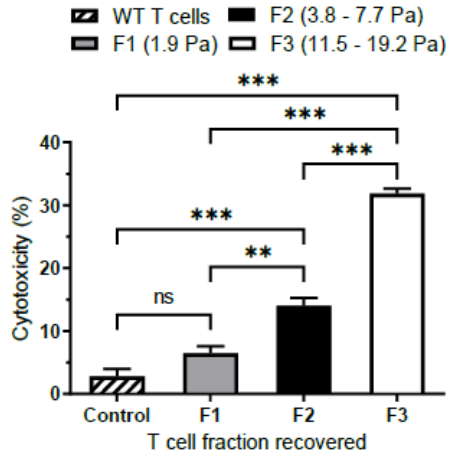




High avidity fractions provoke greater T cell activation & cytotoxicity

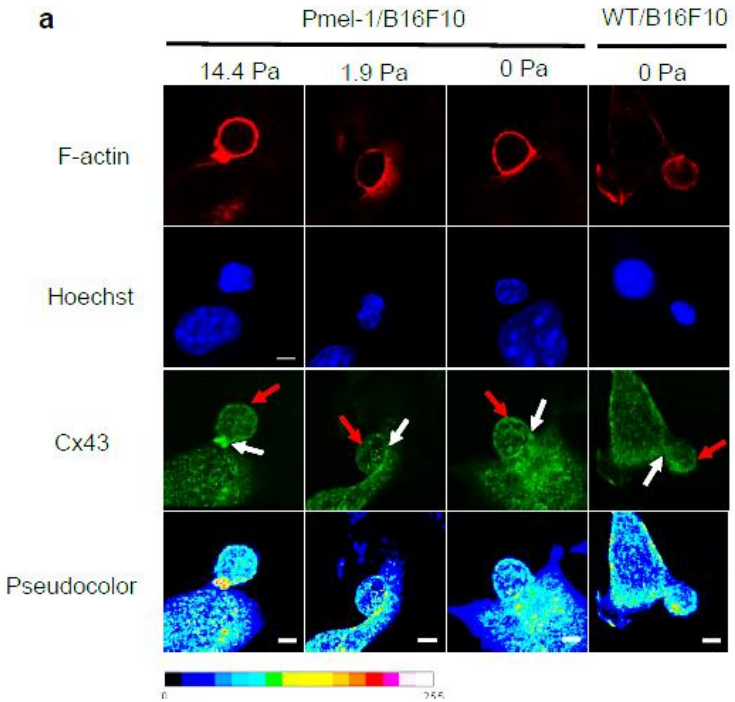


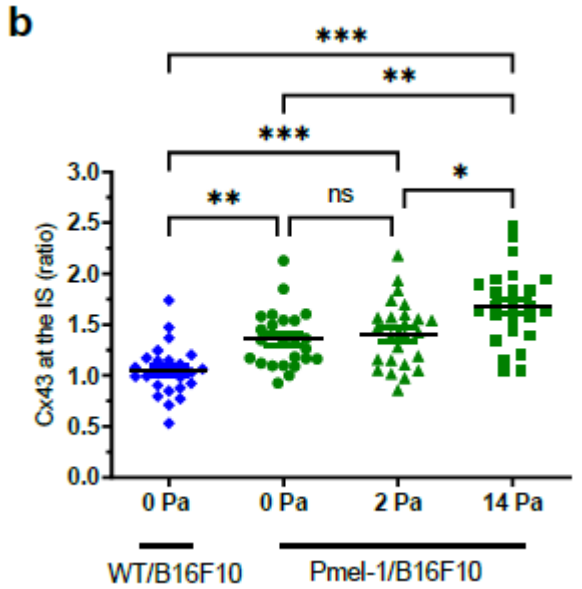




Holistic “Cellular Avidity” selection

Unlike multimer methods, probe all cell-cell interactions not just TCR-pMHC





High shear fractions have greater immunological synapse protein expression

- Selects high functional T cells by physiological cell-cell interactions
- Can probe up to 10,000 interacting cell pairs per device in <1 hour
- Recovers live-cell fractions based on avidity w/ up to 100% purity
- Compatible with supplemental fluorescent, luminescent & functional on-chip assays

Microfluidic opportunities in Pancreatic Cancer:

- Immunotherapy
- Drug screening & delivery
- Cancer cell migration
- Stromal interactions
- Tumour evolution & heterogeneity
- Dormancy & metastasis
- Tumour-on-chip & organ-on-chip models

s.au@imperial.ac.uk

www.biomicrotech.science

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