Supporting Information

Titel: Living Cells Respond to the Interface Tension of Soft Solids

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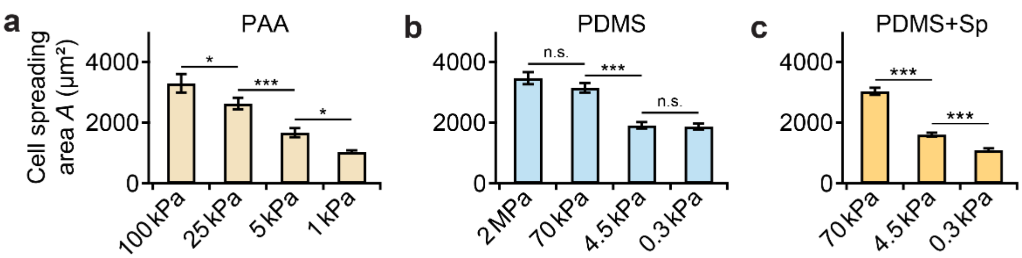
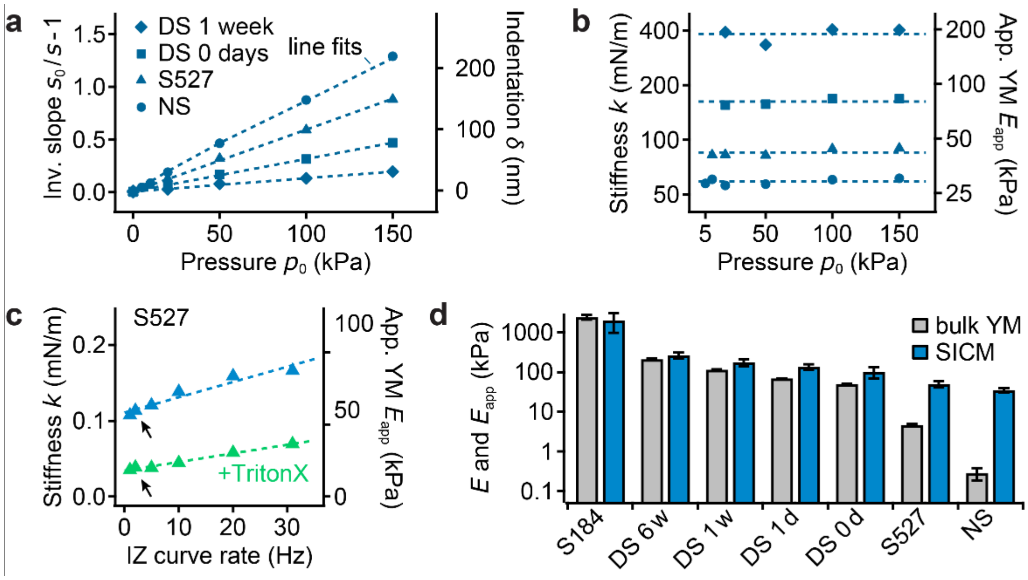
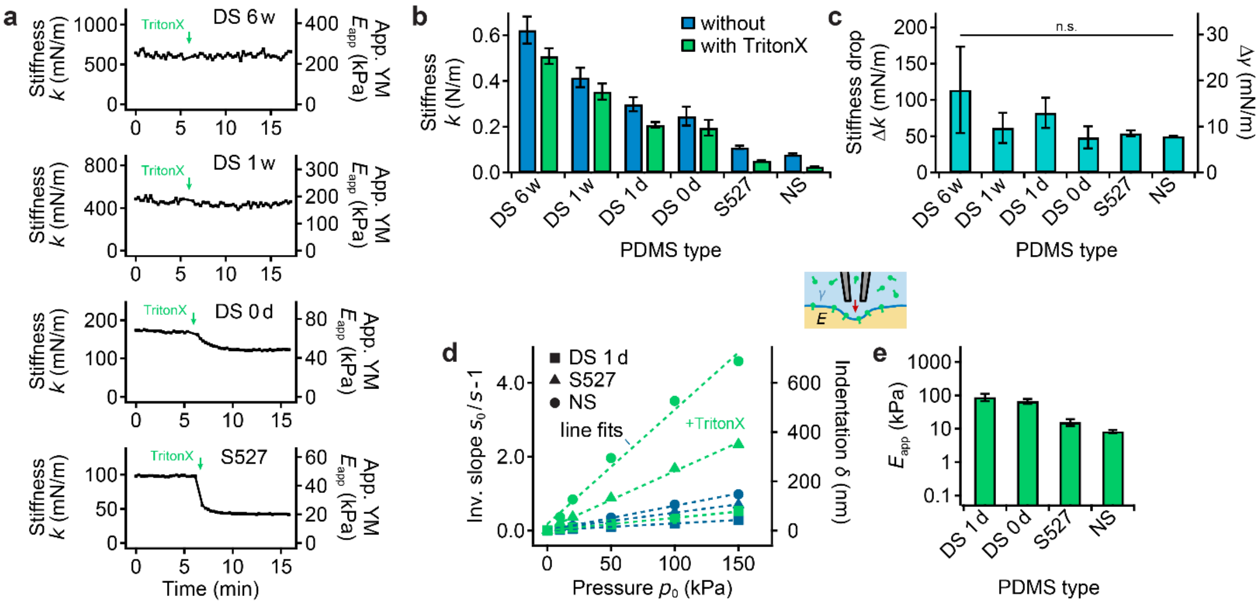


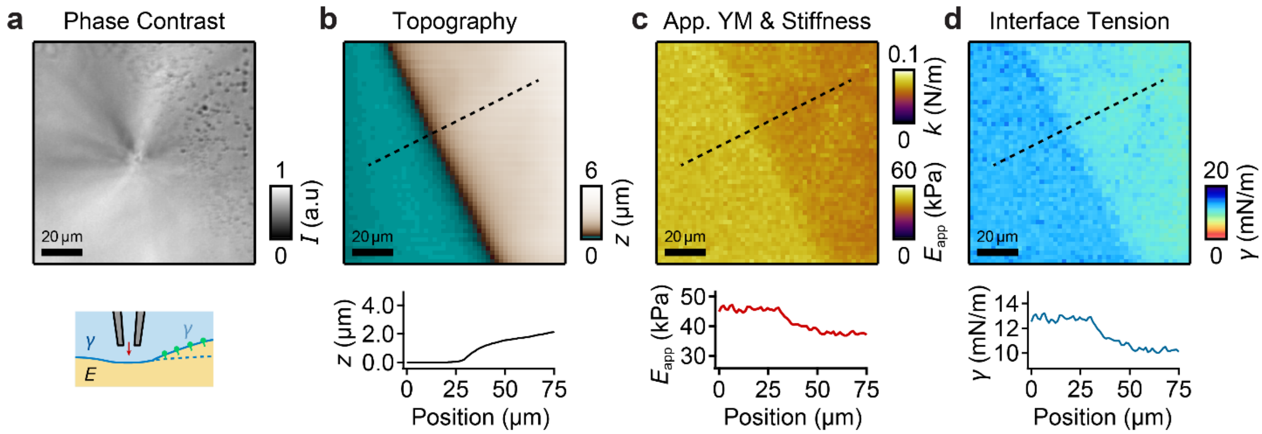
Supplementary Fig. 1: Cell spreading area of fibroblast cells on PAA hydrogel and PDMS elastomer substrates. a,**b**,**c**, Cell spreading area of fibroblast cells on PAA hydrogels (a), on PDMS substrates (b), and on Span85-coated PDMS substrates (c) of different Young's moduli. Bars and error bars show mean and standard error, respectively, from 46 to 124 cells across 3 independent experiments. * for $P < 0.05$, *** for $P < 0.001$, or "n.s." for not significant from Tukey test.



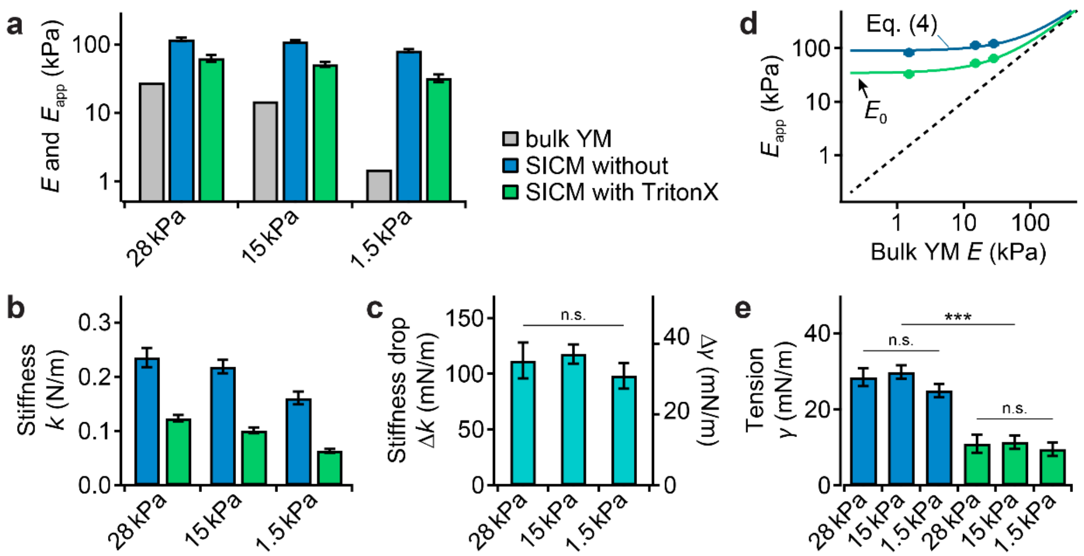
Supplementary Fig. 2: Measuring linearity and viscoelasticity of PDMS samples with SICM. **a**, Inverse *IZ* curve slope (left axis) and indentation δ (right axis) and **b**, stiffness (left axis) and apparent Young's modulus (right axis) vs. applied pressure p_0 for different PDMS samples with line fits showing the linearity of the measured mechanical properties. **c**, Stiffness (left axis) and apparent Young's modulus (right axis) vs. *IZ* curve rate exemplarily for Sylgard 527 without and with TritonX showing a weak linear increase due to viscoelastic effects. The selected *IZ* curve rate of 3 Hz (arrows) is close to the purely elastic mechanical properties at zero curve rate. **d**, Bulk Young's modulus E and apparent Young's modulus E_{app} of different PDMS samples measured by macroscopic indentation and SICM, respectively. Nanopipette radius $r_{\text{i}} = 320$ nm (a,b) and 300 nm (c).



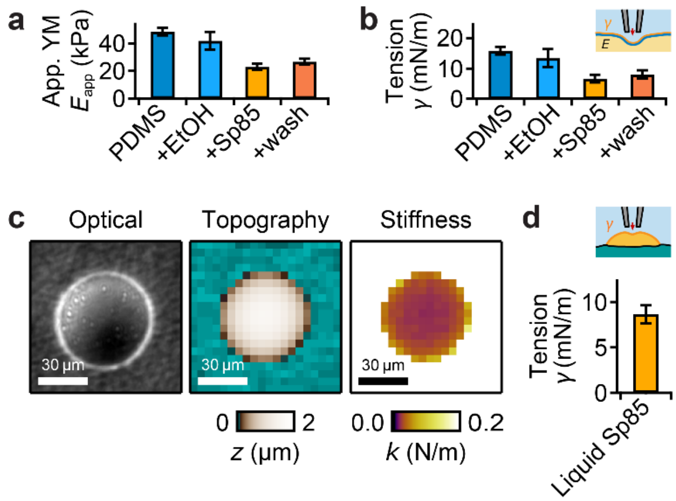
Supplementary Fig. 3: Live addition of TritonX and linearity for different PDMS samples. **a**, Stiffness k and apparent Young's modulus E_{app} of the other PDMS samples measured with SICM during the addition of TritonX. **b**, Stiffness of different PDMS samples measured with SICM without and with TritonX. **c**, Stiffness drop Δk (left axis) and interface tension change $\Delta\gamma$ (right axis) before and after the addition of TritonX. **d**, Inverse *IZ* curve slope (left axis) and indentation δ (right axis) vs. applied pressure p_0 for different PDMS samples without and with TritonX with line fits showing the linearity of the measured mechanical properties in the presence of TritonX. **e**, Apparent Young's modulus E_{app} of different PDMS samples measured with SICM after the addition of TritonX. Nanopipette radius r_{i} = 330 nm and 400 nm (a), 240 nm to 450 nm (b,c), and 300 nm (d,e). "n.s." indicates no significant difference by one-way ANOVA (c).



Supplementary Fig. 4: Mapping of a PDMS sample with spatially varying interface tension. **a-d**, Optical phase contrast image (a), SICM topography image (b), stiffness map (c), and map of local interface tension (d) of a Sylgard 527 PDMS sample with a wedge of hydrophilized PDMS-b-PEO (see schematic and Methods for details). The insets show profiles across the edge (locations indicated by dashed lines). Nanopipette radius $r_\mathrm{i} = 310$ nm and applied pressure $p_0 = 160$ kPa.



Supplementary Fig. 5: Apparent Young's modulus, stiffness, and interface tension of commercial cell culture substrates. **a**,**b**, Bulk Young's modulus E according to the manufacturer's specifications and apparent Young's modulus E_{app} (a) and stiffness k (b) measured by SICM for different ibidi ESS substrates without and with TritonX. **c**, Stiffness drop Δk and interface tension change $\Delta\gamma$ (right panel) before and after the addition of TritonX. **d**, Apparent Young's modulus E_{app} vs. bulk Young's modulus E without and with TritonX with fits of Equation (4) giving $E_0 = 89 \pm 3$ kPa and 34 ± 1 kPa, respectively. **e**, Measured interface tension of the different substrates without and with TritonX. Bars and error bars show the mean and standard deviation, respectively, from 3 independent experiments using nanopipettes with radii between $r_{\mathrm{i}} = 290$ nm to 340 nm. "n.s." for not significant by one-way ANOVA (c) and *** for P < 0.001 or "n.s." for not significant different by the Tukey test (e).



Supplementary Fig. 6: Treatment of PDMS with Span85 and investigation of liquid Span85. **a**,**b**, Apparent Young's modulus E_{app} (a) and measured interface tension γ of PDMS (b) without treatment, after incubation with ethanol alone, with Span85 in ethanol, or after subsequent washing. **c**, Exemplary optical image and SICM topography and stiffness map of a liquid Span85 droplet. **b**, Average interface tension of liquid Span85 droplets. Bars and error bars show the mean and standard deviation, respectively, from 10 independent experiments (a,b) and from 18 droplets (d) measured using nanopipettes with radii between $r_{\mathrm{i}} = 240$ nm and 450 nm (a,b) and between 300 nm and 430 nm (d).

Table S1. Young's moduli of commercial PAA samples (mean and standard deviation, see Methods for details).

Young's modulus E
1.4 ± 0.4 kPa
4.9 ± 0.2 kPa
24.8 ± 0.2 kPa
103.8 ± 1.2 kPa

Table S2. Young's moduli of PDMS substrates measured with macroscopic indentation (mean and standard deviation from 6 to 9 independent experiments, see Methods for details). In case of DowSil, specified times are storage after preparation.

<table>
<tr><th colspan="2">PDMS type</th><th>Young's modulus E</th></tr>
<tr><td colspan="2">Nusil Gel 8100</td><td>280 ± 100 Pa</td></tr>
<tr><td colspan="2">Sylgard 527</td><td>4.5 ± 0.3 kPa</td></tr>
<tr><td rowspan="4">DowSil EI-2888</td><td>0 days</td><td>50 ± 1 kPa</td></tr>
<tr><td>1 day</td><td>69 ± 1 kPa</td></tr>
<tr><td>1 week</td><td>116 ± 2 kPa</td></tr>
<tr><td>6 weeks</td><td>213 ± 7 kPa</td></tr>
<tr><td colspan="2">Sylgard 184</td><td>2.4 ± 0.3 MPa</td></tr>
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