Multiscale modelling shows how cell-ECM interactions impact ECM fibre alignment and cell detachment

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Table 1. Model parameters. Description and values of the parameters used in our simulations.

General parameters	
$\eta = 50$ pN·s·μm^{-1}	Viscous coefficient. Estimated
ECM parameters	
$L^0_{l,m}$	Natural length of the fibre. Determined by the initial condition
$k^{\mathrm{el}}_{l,m} = \frac{E_{l,m} A_{l,m}}{L^0_{l,m}}$	Elastic constant of the fibre
$E_{l,m}$ $E_{l,m} = E_{\mathrm{t}} = 10 - 100$ MPa $E_{l,m} = E_{\mathrm{c}} = 0.1 E_{\mathrm{t}}$ MPa	Young's modulus of the fibres. Reference value from [1,2] Young's modulus of extended fibres Young's modulus of compressed fibres [2]
$A_{l,m}$ Fibre diameter $= 10^{-7}$ m	Cross-sectional area of the fibres [3,4]
Crosslink density, $0.2\,\mu$m^{-2}	[2]
Mean fibre length density, $0.6 - 0.7\,\mu\mathrm{m} \cdot \mu\mathrm{m}^{-2}$	[2]
Cell parameters	
$\kappa^{\mathrm{el}}_i = 5 \cdot 10^3$ pN·μm^{-1}	Elastic constant of cell viscoelastic elements. Estimated
$\kappa^{\mathrm{vi}}_i = 10^3$ pN·s·μm^{-1}	Damping constant of cell viscoelastic elements. Estimated
$l^{\mathrm{c}}_i = 15\ \mu$m	Natural length of viscoelastic elements. Estimated from cell sizes.
$\kappa^{\mathrm{el}}_i = 1$ pN·rad^{-1}	Angular elastic constant of the viscoelastic elements. Estimated
$\theta^0_{i,j}$	Natural angle between viscoelastic elements. Determined by initial cell shape.
$F^{\mathrm{co}} = 10^3 - 5 \times 10^4$ pN	Estimated. Reference values [5–7].
Integrin and FAs parameters	
$k^{\mathrm{i}} = 10^6$pN $\cdot\,\mu$m^{-1}	Elastic constant of the integrins, see [8].
$\mathrm{K_{on}} = 0.2\,\mathrm{s}^{-1}$	Integrins binding rate, estimated value. Reference value for estimation [7,9]
$\mathrm{K_{off}}(F^{\mathrm{i}}_{i,l}) = 0.4 \exp\left(-0.04 F^{\mathrm{i}}_{i,l}\right) + 4 \times 10^{-7} \exp\left(0.2 F^{\mathrm{i}}_{i,l}\right)$	Integrin unbinding rate, [9]
$N = \frac{6000}{N^{\mathrm{c}}_n}$ integrins	Estimated available integrins per FA site. N^{c}_n is the number of FA sites in the n-th cell

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