

Supplemental Information

Materials and Methods:

Human Dermal Fibroblast culture, transfection, and imaging

Adult human dermal fibroblasts (HDFa) (Invitrogen, Carlsbad, CA) were cultured in Medium 106 with Low serum growth supplements (Invitrogen, Carlsbad, CA). HDFa were transfected with GFP-Progerin (Broers *et al.* 1999) and DsRed-NLS (Clontech 632408, Mountain View, CA) using Lipofectamin LTX with Plus (Invitrogen, Carlsbad, CA) according to the manufactures' protocol. DsRed-NLS consists of a DsRed fluourophore fused with three nuclear localization signals. Experiments were performed 48 hrs post-transfection.

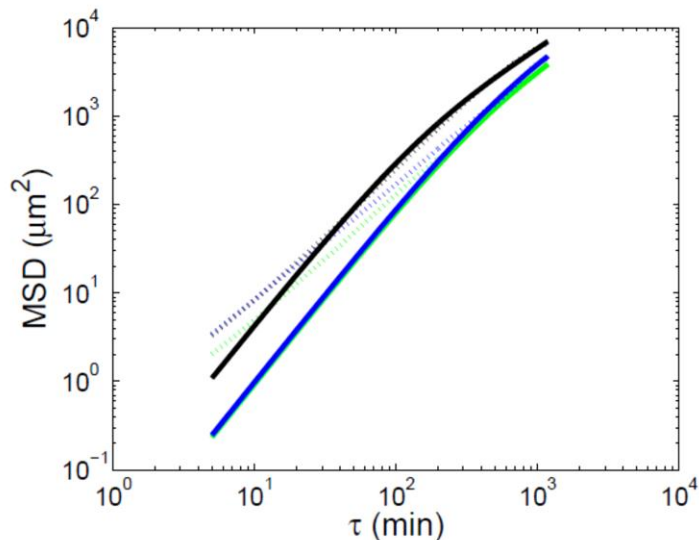
We acquired time-lapse images of cells on pillars on an Olympus Bx51 upright (Olympus, Rungis, France). The microscope was equipped with a heater to maintain a temperature of 37°C. Cell media was changed 2 hours prior to the experiment to leibovitz media which does not require 5% CO₂ (Invitrogen, Carlsbad, CA). A HQ² (Olympus upright microscope, Roper Scientific, Evry, France). The microscope used Metamorph software (Universal Imaging Corporation, Downingtown, PA). Bright field images were acquired prior to time lapse imaging and after time lapse imaging. Time lapse imaging was done every 3 minutes in the fluorescent channels, GFP and DsRed.

Movies

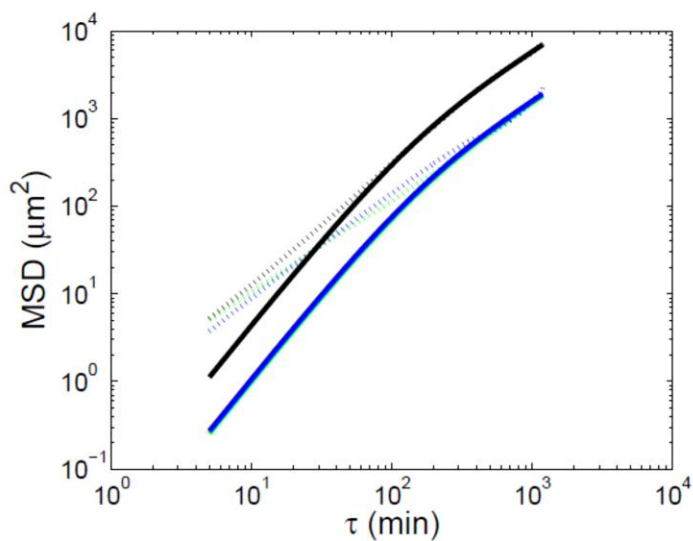
Movie S1: NIH 3T3 with endogenous GFP Lamin-A shows nuclear deformation upon entering micropillars. The movie shows an overlay of the GFP channel and the micropillars. A cell nucleus can be seen at the periphery of the micropillars then deforms in order to enter and migrate through the micropillars. The micropillars are at a 4 μm spacing and 5 μm in diameter. The movie duration is 5 hours images acquired every 5 minutes, frame rate is 10 frames/sec.

Movie S2: HDFa translocate through micropillars. HDFa cell transfected with DsRed-NLS and GFP-progerin migrates through 10 μm pillars with an 8 μm spacing obstacle course. Pillars are indicated by blue circles overlaid on the pillars during the movie. The cell aligns its nucleus in the micropillars migrates up through the pillars, pauses, and turns to continue moving laterally through the pillars. The movie duration is 4 hours images acquired every 3 minutes, frame rate is 10 frames/ sec.

Figures



Supplementary Figure 1: Orstein-Uhlenbeck (OU) model¹ and raw data for control data. Raw data represented by dashed lines. Fitted OU model represented by solid lines. Data from cells on flat substrate shown in black, 10⁻¹² substrate shown in blue, and 10⁻⁶ substrate shown in green.



Supplementary Figure 2: OU model and raw data for HGPS data. Raw data represented by dashed lines. Fitted OU model represented by solid lines. Data from cells on flat substrate shown in black, 10⁻¹² substrate shown in blue, and 10⁻⁶ substrate shown in green.

1. D. Selmeczi, S. Mosler, P. H. Hagedorn, N. B. Larsen, H. Flyvbjerg, *Biophys. J.* 2005, 89. 912-31.