contribute to cartilage degradation in OA. Since both S100A4 and IL-1 β have been found to be increased in OA cartilage, this novel pathway could provide a novel pathway for IL-1 β mediated production of MMP-13 in chondrocytes. Thus, our study can be partially ameliorated by maintaining a spherical cell morphology. Using micropatterned substrates to control cell shape, we examined the hypothesis that the biomechanical properties of chondrocytes are altered in association with de-differentiation during passage.

Methods: Superficial and middle/deep zone chondrocytes were isolated from knee cartilage from skeletally mature pigs (N = 10). Chondrocytes were serially expanded for three passages (P0-P3), and single-cell viscoelastic properties were measured after each passage (n = 43-58) using atomic force microscopy (AFM). Mechanical tests were also measured for passaged cells cultured on restrictive micropatterned surfaces (8 μm islands) created using self-assembled monolayers (SAMs) (n = 21-31, Fig. 1). The differentiation state of zonal chondrocytes was verified using quantitative real-time PCR of collagen I and II.

Results: Characteristic differences between superficial and middle/deep zone cells were present at P0 as evidenced by their mechanical properties and gene expressions. After subsequent monolayer expansion, cells progressed towards a more homogenous mechanical and biochemical phenotype. Subsequent culture on micropatterned surfaces appeared to induce a recovery of cellular mechanical characteristics towards the chondrocytic phenotype.

Conclusions: The current findings support the hypothesis that cellular biomechanical properties correlate with phenotype. Results suggest that chondrocyte de-differentiation is characterized by phenotypic changes in both biochemical and biomechanical characteristics. The effects of de-differentiation on chondrocytes can be partially ameliorated by maintaining a spherical cell mor-