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Effects of uniaxial stretch forces and matrix stiffness on the cell behavior of desmoid-type fibromatosis

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We hypothesized that desmoid cells and tumors are affected by the mechanical forces, and investigated the effects of two kinds of mechanical forces on the cell behaviors of desmoid tumors; uniaxial stretches and matrix stiffness. All desmoid cells (WT, 41A, 45F) were cultured in monolayer and evaluated at 12 and 24 hours' time point. Contrary to the expectations based on the preliminary experiments, any uniaxial stretches (1Hz, 10%; 1Hz, 20%; 10Hz, 10%; 10Hz, 10%; 10Hz, 20%; 30Hz, 10%; 30Hz, 20%) did not increase the cell proliferation, but tended to decrease. Stretch with 60Hz, 10 or 20% significantly decrease the cell proliferation. Uni-axial sinusoical stretches enhanced cell proliferation of desmoid cells, whereas did not of control fibroblast cells. Nuclear accumulation of □-catenin was not increased in proliferated desmoid cells under uni-axial stretch.

Because uniaxial cell stretch did not show the stimulatory effects on cell proliferation. We hypothesized that matrix stiffness might have significant roles for cell proliferation. We examined effects of various mastic stiffness on desmoid cell proliferation using culture plate with matrix stiffness of 0.5, 2, 8, 16, 32, 64 kPa, and standard culture plate. Interestingly, cell proliferation increased matrix stiffness dependent manner. In parallel with cell proliferation and matrix stiffness, □-catenin expression was also up-regulated.