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Modifications of the structure of the pericellular matrix measured via optical force probe microscopy LOUIS MCLANE, ANTHONY KRAMER, PATRICK CHANG, JENNIFER CURTIS, Georgia Institute of Technology — The pericellular matrix is a large protein and polysaccharide rich polymer layer attached to the surface of many cells, and which often extends several microns out from the cell surface into the surrounding extracellular space. Here we study the intrinsic nature and modifications of the structure of the pericellular coat on rat chondrocytes with the use of optical force probe microscopy. Optical force probe studies allow us to make both dynamic force measurements as well as equilibrium force measurements throughout the coat. These force measurements are used to observe the structural change in the coat with the addition of exogenous aggrecan. Not only does addition of exogenous aggrecan dramatically swell our coat to well over twice in size, our analysis indicates that the addition of exogenous aggrecan decreases the mesh size throughout the coat. We speculate that the added aggrecan binds to available binding sites along the hyaluronan chain, both enlarging the coat's size as well as tightening up the opening within the coat. We further suggest that the available binding sites for the exogenous aggrecan are abundant in the outer edges of the coat, as both the dynamic and equilibrium forces in this region are changed. Here, both force measurements show that forces closest to the cell membrane remain relatively unchanged, while the forces in the outer region of the coat are increased. These results are consistent with those obtained with complementary measurements using quantitative particle exclusion assays.

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