Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Rheological Investigation of Protein Interactions in Synovial Fluid REBECCA KLOSSNER, North Carolina State University , WENDY KRAUSE, North Carolina State University , RALPH COLBY, Pennsylvania State University — Hyaluronic acid and the plasma proteins, albumin and γ-globulins, are the most abundant macromolecules in synovial fluid, the fluid that lubricates our freely moving (synovial) joints. In previous studies, bovine synovial fluid, a synovial fluid model and albumin in phosphate buffered saline (PBS) were observed to be rheopectic—viscosity increases over time under constant shear. Rheopexy is indicative of structure building in solution. To further investigate the contribution of albumin to the observed rheopexy, rheological experiments were conducted on bovine serum albumin (BSA) in PBS at concentrations comparable to those found in the synovial joints. Our data suggests that the plasma proteins aggregate together under these low shear conditions further entangling the hyaluronic acid chains, which results in an increase in the apparent viscosity of the synovial fluid over time. The nature of the proposed aggregation was probed by varying the salt concentration and pH in order to partially denature the protein and interrupt any hydrogen bonding. Additionally, similar rheological experiments were carried out using methylated albumin in order to observe the role of the disulfide bridges in the protein aggregation.

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Date submitted: 30 Nov 2005 Electronic form version 1.4