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Multiscale Mechanics of Fibrin Polymer ANDRE BROWN, RUSTEM LITVINOV, DENNIS DISCHER, PRASHANT PUROHIT, JOHN WEISEL, University of Pennsylvania — Blood clots and thrombi consist primarily of fibrin, a branched, open mesh of polymeric fibers made of protein monomers, with a remarkable and unexplained extensibility and elasticity. Understanding the origin of fibrin mechanics may ultimately be significant for modulating thrombosis and bleeding. We propose that the unique mechanical properties of fibrin are based on its ability to undergo concerted structural rearrangements at the network, fiber, and molecular levels. Stretching of a whole fibrin clot is followed by clot shrinkage, fiber alignment and bundling, and extension of the constituent fibrin molecules. We develop constitutive models that integrate these quantitative observations and suggest that fibrin extensibility and elasticity are largely manifestations of protein unfolding.

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