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Investigating the Mechanical Properties of Plasma von Willebrand Factor Using Atomic Force Microscopy SITARA WIJERATNE, ERIC BOTELLO, Department of Physics and Astronomy, Rice University, HUI-CHUN YEH, ZHOU ZHOU, ANGELA BERGERON, Department of Medicine, Baylor College of Medicine, ERIC FREY, Department of Physics and Astronomy, Rice University, JOEL MOAKE, Department of Bioengineering, Rice University, JING-FEI DONG, Department of Medicine, Baylor College of Medicine, CHING-HWA KIANG, Department of Physics and Astronomy, Rice University — Single-molecule manipulation allows us to study the real-time kinetics of complex cellular processes. The mechanochemistry of different forms of von Willebrand factor (VWF) and their receptor-ligand binding kinetics can be probed by atomic force microscopy (AFM). Since plasma VWF can be activated upon shear, the structural and functional properties of VWF that are critical in mediating thrombus formation become important. Here we characterized the mechanical resistance to domain unfolding of VWF to determine its conformational states. We found the shear-induced conformational changes, hence the mechanical property, can be detected by the change in unfolding forces. The relaxation rate of such effect is much longer than expected. Our results offer an insight in establishing strategies for regulating VWF adhesion activity, increasing our understanding of surface-induced thrombosis as mediated by VWF.

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