

# Annual Conference and Expo on **Biomaterials**

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## **Biomechanical characterization of von Willebrand Factor: A giant multimeric plasma protein**

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The large, multimeric plasma protein von Willebrand Factor (VWF) plays an essential role in capturing platelets onto the damaged vascular wall, allowing the initiation of blood clotting. VWF effectively senses blood flow, changing conformation in high flow from an inactive, compact globule to an elongated shape that allows VWF to interact with both platelets and damaged vascular wall. Although basic biological properties of VWF have been elucidated, little is known about the detailed biomechanical properties of vWF and how these properties dictate its structure and function in flow environments. We have adapted single-molecule force measurement approaches to study how mechanical aspects of VWF relate to its biological functions. Herein, we employed single-molecule optical tweezers to monitor in real time the structural stability of VWF. We demonstrated that the A2 domain of VWF unfolds in response to tensile force and exposes its Tyr842-Met843 scissile bond for cleavage by ADAMTS13, a metalloprotease found in the circulating blood. Such process provides an important mechanism to convert the highly thrombogenic, ultra large vWF multimers in blood shear to smaller multimeric forms and consequently to prevent overgrown thrombus. In addition, we have directly observed the force induced conformational change in vWF that is essential for VWF's activation under blood flow. Together, the study has revealed the biomechanical properties of vWF, with significant insight for the design of synthetic molecules based on VWF in pursuit of targeted drug therapies.

### **Biography**

Xiaohui Zhang has received his Doctorate in Physiology and Biophysics from the University of Miami in 2003. From 2004 to 2008, he did his Postdoctoral Training at Harvard Medical School with Prof. Timothy A. Springer. Before joining the Lehigh Faculty, he served as a Principal Investigator at the Institute of Biochemistry and Cell Biology of the Chinese Academy of Sciences. He has published over 40 research articles in journals such as Science, Nature and PNAS. His research and teaching focus on the structural and biomechanical properties of proteins, protein engineering, biomechanics, physiology and biophysics.

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