

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Hematocrit and flow rate regulate the adhesion of platelets to von Willebrand factor HSIEH CHEN, Massachusetts Institute of Technology, JENNIFER ANGERER, MATTHIAS SCHNEIDER, Boston University, ALFREDO ALEXANDER-KATZ, Massachusetts Institute of Technology — Here we present theoretical and experimental results showing that under the action of flow the adhesion probability of platelets to von Willebrand factor coated surfaces is strongly dependent on the hematocrit and flow rate. Interestingly, from experiments we observed that the actual binding forces are not markedly different, which suggest that the origin of such behavior is in the distribution of platelets. The experimental findings were solidly supported by explicit hydrodynamic simulations as well as stochastic differential equation simulations. We proposed a platelet transport model that, to our best knowledge, is the first in this field to have exact mathematical connections to the red blood cell distributions and shear rates. These findings present an important advance in understanding the dependence of blood clotting on hematocrit and can lead to advances in the treatment of vascular diseases associated with high levels of red blood cells. Furthermore, from the technological side the results presented here are important in areas where fine control of the separation of different classes of colloids is desired.

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Date submitted: 07 Nov 2012

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