Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Role of receptor patch geometry for cell adhesion in hydrodynamic flow CHRISTIAN KORN, ULRICH SCHWARZ, University of Heidelberg

— Motivated by the physiological and biotechnological importance of cell adhesion under hydrodynamic flow, we theoretically investigate the efficiency of initial binding between a receptor-coated sphere and a ligand-coated wall in linear shear flow. Using a Langevin equation that accounts for both hydrodynamic interactions and Browian motion, we numerically calculate the mean first passage time (MFPT) for receptor-ligand encounter. We study how the MFPT is influenced by flow rate, receptor and ligand coverage, and receptor patch geometry. With increasing shear rate, the MFPT decreases monotonically. Above a threshold value of a few hundreds, binding efficiency is enhanced only weakly upon increasing the number of receptor patches. Increasing the height of the receptor patches increases binding efficiency much more strongly than increasing their lateral size. This strong dependance on out-off-plane geometry explains why white blood cells adhere to the vessel walls through receptor patches localized to the tips of microvilli, and why malaria-infected red blood cells form elevated receptor patches (*knobs*). [1] C. Korn and U. S. Schwarz, *Phys. Rev. Lett.* **97**: 138103, 2006. [2] C. B. Korn and U. S. Schwarz. *J. Chem. Phys.* **126**: 095103, 2007

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Date submitted: 27 Nov 2007

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