Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

The wall traction induced by flowing red blood cells in model microvessels and its potential mechanotransduction[1] JONATHAN FREUND, University of Illinois at Urbana-Champaign, JULIEN VERMOT, IGBMC, CNRS/INSERM/UdS — There is evidence in early embryonic development, even well before advective oxygen transport is important, that the presence of red bloods cells *per se* trigger essential steps of normal vascular development. For example, Lucitti *et al.* [*Development* **134**, 3317 (2007)] showed that sequestration of blood cells early in the development of a mouse, such that the hematocrit is reduced, suppresses normal vascular network development. Vascular development also provides a model for remodeling and angiogenesis. We consider the transient stresses associated with blood cells flowing in model microvessels of comparable diameter to those at early stages of development (6μm to 12μm). A detailed simulation tool is used to show that passing blood cells present a significant fluctuating traction signature on the vessel wall, well above the mean stresses. This is particularly pronounced for slow flows ($\lesssim 50\mu$m/s) or small diameters ($\lesssim 7\mu$m), for which root-mean-square wall traction fluctuations can exceed their mean. These events potentially present mechanotranduction triggers that direct development or remodeling. Attenuation of such fluctuating tractions by a viscoelastic endothelial glycocalyx layer is also considered.

[1]NSF supported

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Date submitted: 02 Aug 2013 Electronic form version 1.4