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Flow through flexible cylinders inspired by the endothelial glycocalyx LAUREN COOPER, DANIEL FOVARGUE, LAURA MILLER, The University of North Carolina at Chapel Hill — Inspired by the recent shift in hypertension research, we present a new computational model to better examine blood flow induced shear stress in the endothelial surface layer (ESL). The ESL is the luminal side barrier between blood and the endothelial cells that line the vessel wall and has been of interest due to its function as a mechanotransducer.[1] Further, it is believed that shear stress seen by the ESL, induced by blood flow, is converted to chemical responses such as blood pressure regulation. We utilize the Immersed Boundary method to simulate blood flow through a vessel and examine the shear stress at the ESL over different heights and flexibilities. We compare our results in the Reynolds number regime of a canine capillary with previous computational models[2] and experimental results.

[1]Squire, J. M., Chew, M., Nneji, G., Neal, C., Barry, J. & Michel, C. C., 2001. Quasi-periodic substructure in the microvessel endothelial glycocalyx: a possible explanation for molecular filtering? J. Struct. Bio. 136, 239-255.
[2]Weinbaum, S., Tarbell, J., Damiano, E., 2000. The Structure and Function of the Endothelial Glycocalyx Layer. Pflügers Arch. – Eur. J. Physiol. 440, 653–666.

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