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Flow-Induced Stress Distribution in Porous Scaffolds[1] DIMITRIOS PAPAVASSILIOU, ROMAN VORONOV, SAMUEL VANGORDON, VASSILIOS SIKAVITSAS, The University of Oklahoma — Flow-induced stresses help the differentiation and proliferation of mesenchymal cells cultured in porous scaffolds within perfusion bioreactors. The distribution of stresses in a scaffold is thus important for understanding the tissue growth process in such reactors. Computational results for flow through Poly-L-Lactic Acid porous scaffolds that have been produced with salt-leaching techniques, and for scaffolds that have been constructed with nonwoven fibers, indicate that the probability density function (pdf) of the wall stress, when normalized with the mean and the standard deviation of the pdf, appears to follow a single type of pdf. The scaffolds were imaged with micro-CT and the simulations were run with lattice Boltzmann methods. The parameters of the distribution can be obtained using Darcy's law and the Blake-Kozeny-Carman equation. Experimental results available in the literature appear to corroborate the computational findings, leading to the conclusion that stresses in high-porosity porous materials follow a single distribution.

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