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Variation of flow-induced stresses within scaffolds used in bone tissue engineering[1] DIMITRIOS PAPAVASSILIOU, NGOC PHAM, ROMAN VORONOV[2], VASSILIOS SIKAVITSAS, The University of Oklahoma — Bone tissue engineering is often based on seeding adult stem cells on porous scaffolds and subsequently placing these scaffolds in flow perfusion bioreactors to stimulate cell differentiation and cell growth. In the present study, the distribution of stresses in structured porous scaffolds under flow is investigated by calculating the probability density function of flow-induced stresses in different scaffold geometries with simulations. The physical reason for the development of particular stress distributions is further explored, and it is found that the direction of flow relative to the internal architecture of the porous scaffold is important for stress distributions. When the flow direction is random relative to the configuration of the geometric elements making up the scaffold, it is found that a common distribution, such as the one suggested by Voronov et al. (Appl. Phys. Let., 2010, 97:024101), can be used to describe the stress distribution.

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