Abstract Submitted
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Flow and nutrient transport through porous scaffolds used for the culture of bone cells in perfusion bioreactors[1] DIMITRIOS PAPAVASSILIOU, The Uninversity of Oklahoma, ROMAN VORONOV, VASSILIOS SIKAVITSAS, The University of Oklahoma, SAMUEL VANGORDON — The goal is to understand via computation the behavior of the flow inside porous scaffolds that are used in bone tissue bioreactors. Fluid shear is an important stimulatory factor in preosteoblastic cells seeded in scaffolds and cultured under continuous flow perfusion. A Lattice Boltzmann method has been employed to simulate the flow field within porous scaffolds obtained with high resolution micro-CT. Lagrangian methods have also been used to determine the nutrient dispersion inside the scaffolds. The shear stresses calculated inside the scaffold architecture indicate that the shear stresses experienced by cells inside the scaffold can vary by orders of magnitude. This is important when designing scaffolds for bone tissue growth, since osteoblastic cells require to be stimulated by shear for growth. Moreover, cell detachment can occur when the fluid shear is too high, thus, placing a limit on the stresses that a particular scaffold design should allows. The talk will address the methodology, the validation and the correlation of scaffold structure characteristics with the shear stresses and with the rate of mass transfer.

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