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The role of fluid transport in cancer metastasis to bone[1] TRUNG LE, LAHCEN AKERKOUCH, HANEESH JASUJA, KALPANA KATTI, DINESH KATTI, North Dakota State University — Prostate Cancer exhibits a susceptibility to metastasize to bone resulting in a significantly high morbidity and mortality rate. While mechanotransduction has been known to play an important role in normal cellular growth, it is unclear how it regulates cancer cells growth, especially inside bones. In this work, we investigate the influence of mechanical signals to prostate cancer cells progression to bone. Prostate cancer cells are seeded in a tissue engineered bone scaffold, which is under a steady flow mimicking blood transport. We perform Computational Fluid Dynamics (CFD) simulations based on micro-Computed Tomography scans of the scaffold, which is exposed to various flow conditions. The CFD simulations are performed with the immersed boundary method (Gilmanov, Le, Sotiropoulos, JCP 300, 1, 2015). Our simulation results show a uniform fluid dispersion outside the scaffold. However, the fluid transport inside the bone scaffold is complex and dependent on the porous topology arrangements. A critical threshold for the pore size is found at which maximum velocity within the scaffold is reached. From experimental observation, we observe the significant changes in the growth of cancer cells depending on shear forces condition.

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