428o Substrate Softness Directs Differentiation of Human Stem Cells

Adam Engler and Dennis E. Discher

Anchorage-dependent cells require adhesive attachment to solids, but clearly not all solids are equal. Mesenchymal stem cell (MSCs) are not only anchorage-dependent but also, we show, directed in their differentiation by matrix softness or elasticity that is typical of tissues. When typical tissue elasticities for muscle, brain, and cartilage/bone are mimicked with hydrogels, we find that MSCs differentitate toward these respective tissue types without any difference in growth or media conditions (eg. 10% serum). While we find myosin is key and that differentiation and expression markers are further amplified by known chemical stimuli, the data primarily implies that the softness or stiffness of the microenvironment is critical for cell development and perhaps essential to mimic in stem cell therapies.