

Abstract Submitted
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Matrix elasticity directs stem cell differentiation in 3D too AL-
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sylvania — Microenvironments appear important in stem cell lineage specification
but can be difficult to adequately characterize or control with soft tissues. Naive
mesenchymal stem cells (MSCs) are shown here to specify lineage and commit to
phenotypes with extreme sensitivity to tissue level elasticity. Soft matrices that
mimic brain are neurogenic, stiffer matrices that mimic muscle are myogenic, and
comparatively rigid matrices that mimic collagenous bone prove osteogenic. During
the initial week in culture, reprogramming of these lineages is possible with addition
of soluble induction factors, but after several weeks in culture, the cells commit to
the lineage specified by matrix elasticity, consistent with the elasticity-insensitive
commitment of differentiated cell types. Inhibition of nonmuscle myosin II blocks
all elasticitydirected lineage specification—without strongly perturbing many other
aspects of cell function and shape. The results have significant implications for un-
derstanding physical effects of the in vivo microenvironment and also for therapeutic
uses of stem cells.

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