Physical cues of cell culture materials lead the direction of differentiation lineages of pluripotent stem cells

ABSTRACT

Both human pluripotent stem cells (hPSCs) from embryonic stem cells (hESCs) and induced pluripotent stem cells (hiPSCs) have the potential ability to differentiate into many different cell types originating from all three germ layers. This review discusses physical cues from natural and synthetic biomaterials that guide the differentiation of hESCs and hiPSCs into several different lineages. We place special focus on how the hPSC differentiation fate is affected by (a) the elasticity of biomaterials used for hPSC culture, (b) the topography of biomaterials used for hPSC culture, and (c) the mechanical forces associated with biomaterials (stretching and electrical stimulation via biomaterials) used for hPSC culture.