

Stem cell culture on polyvinyl alcohol hydrogels having different elasticity and immobilized with ECM-derived oligopeptides

ABSTRACT

The physical characteristics of cell culture materials, such as their elasticity, affect stem cell fate with respect to cell proliferation and differentiation. We systematically investigated the morphologies and characteristics of several stem cell types, including human amniotic-derived stem cells, human hematopoietic stem cells, human induced pluripotent stem (iPS) cells, and embryonic stem (ES) cells on poly(vinyl alcohol) (PVA) hydrogels immobilized with and without extracellular matrix-derived oligopeptide. Human ES cells did not adhere well to soft PVA hydrogels immobilized with oligovitronection, whereas they did adhere well to PVA hydrogel dishes with elasticities greater than 15 kPa. These results indicate that biomaterials such as PVA hydrogels should be designed to possess minimum elasticity to facilitate human ES cell attachment. PVA hydrogels immobilized with and without extracellular matrix-derived oligopeptides are excellent candidates of cell culture biomaterials for investigations into how cell culture biomaterial elasticity affects stem cell culture and differentiation.

Keyword: Biomaterial; Cell culture; Elasticity; Poly(vinyl alcohol); Stem cell