HYALURONAN AND SULPHATED HYALURONAN MICROPATTERNS: EFFECT OF CHEMICAL AND TOPOGRAPHIC CUES ON LYMPHATIC ENDOTHELIAL CELL ALIGNMENT AND PROLIFERATION

D. Pasqui, A. Rossi, R. Barbucci, S. Lamponi, R. Gerli, E. Weber

Department of Neuroscience (AR, RG, EW), Molecular Medicine Section and Department of Chemical and Biosystem Science and Technology (DP, RB, SL), University of Siena, Siena, Italy; Interuniversity Research Center for Advanced Medical Systems (DP, AR, RB, SL, EW); DP and AR contributed equally to this work.

ABSTRACT

While tissue engineered blood vessels have entered surgical practice, the construction of artificial lymphatic vessels has never been attempted due to the small dimensions and fragility of lymphatic vessels. A possible alternative would be to obtain a new growth of interrupted lymphatic vessels. We have previously reported that lymphatic endothelial cells align when cultured on striped micropatterns of hyaluronan (Hyal) and aminosilanized glass. We here report a comparative study in which lymphatic endothelial cells have been plated on micropatterns with stripes of different width and height obtained by the photoimmobilization of Hyal and its sulphate derivative (HyalS) on aminosilanized glass to verify whether their response correlated with surface-chemistry and/or topography. On Hyal micropatterns, cells adhered to aminosilanized glass, avoiding Hyal stripes and molding their shape in accordance to the micropattern topography. Stress fibers, integrins and focal adhesion kinase organized accordingly. HyalS micropatterns with the same topography were unable to guide cell response, cells randomly adhered to HyalS and glass stripes, and polarization was attained only by increasing stripe height. These data indicate that surface chemistry is the main cue responsible for lymphatic endothelial cell guidance. When surface chemistry of stripes promotes cell adhesion as well as that of the substrate, topographical parameters become prevalent. Micropatterns with defined chemical and topographical properties may contribute to the design of new platforms for controlled cell growth in tissue engineering of lymphatic vessels.