Human platelet lysate gel provides a novel 3D-matrix for enhanced culture expansion of mesenchymal stromal cells

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Abstract

Cell culture protocols have specific requirements in regenerative medicine. Human platelet lysate (HPL) has proven as effective substitute for fetal calf serum (FCS) without the risk of xenogeneic immune reactions or transmission of bovine pathogens. Heparin needs to be added as anticoagulant before addition of HPL to culture medium - otherwise HPL-medium forms a gel within few hours. Here, we demonstrated that such HPL-gels provide a suitable 3D-matrix for cell culture which - apart from heparin - consists of the same components as the over-layered culture medium.

Mesenchymal stromal cells (MSC) grew in several layers at the interface between HPL-gel and HPL-medium without contact to any artificial biomaterials. Notably, proliferation of MSC was much higher on HPL-gel compared to tissue culture plastic (TCP).

Furthermore, the frequency of initial fibroblastoid colony forming units (CFU-f) was increased on HPL-gel. The viscous consistency of HPL-gel enabled passaging with a convenient harvesting and re-seeding procedure by pipetting of cells together with their HPL-matrix - this method does not require washing steps and can easily be automated. Alternatively, plasmin could be added to dissolve HPL-gels. The immunophenotype and in vitro differentiation potential of MSC were not affected by culture-isolation on HPL-gel. Taken together, HPL-gel has many advantages over conventional plastic surfaces: it facilitates enhanced CFU-f outgrowth, increased proliferation rates, higher cell densities and non-enzymatic passaging procedures for culture expansion of MSC.