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3D model of thrombopoiesis

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The hypothesis for the present work is that a complex in vitro 3D bone marrow-like environment can be used to gain fundamental mechanistic insight into cell signalling and matrix-cell interactions in the bone marrow niche related to megakaryocyte development. The bioreactor consists of 3 wells within a PDMS block which is plasma bonded to cover glass for imaging. Each bioreactor well was perfused by stainless steel needles, spanned by porous silk microtubes as blood vessel scaffolds connected to tubing for media perfusion using a programmable syringe pump. These microtubes were prepared by dipping straight lengths of stainless steel wire into aqueous silk fibroin to obtain blood vessel scaffolds. Defined pore sizes of 6-8 μm were obtained by adding poly(ethylene oxide) to the silk fibroin. The perfused silk tubes comprised the vascular niche and were embedded within a cell-seeded hydrogel which comprises the osteoblastic niche, modified with incorporation of collagen I. The silk microtubes were coated with a combination of Fibrinogen, von Willebrand Factor, type IV collagen and SDF-1 alpha, to better recreate the composition of the vascular niche. After staining, human umbilical cord blood derived megakaryocytes were added to hydrogel and megakaryocytes migration was analyzed in a time-dependent manner using confocal microscopy analysis. Further, flow effluent through the vascular tubes in the bioreactor was collected on a regular time interval and platelet number and function was analyzed by flow cytometry and microscopy. Culture released platelets was counted as CD61+ and events with the same scatter properties of human blood platelets.

Biography

Alessandra Balduini is a Medical Doctor with vast experience in research of stem cell and megakaryocyte biology, and also in the clinical aspects of the diseases related to platelets and clotting processes. She is Associate Professor of Medicine at the University of Pavia, Italy and Research Assistant Professor at the Department of Biomedical Engineering, Tufts University, Boston, USA. In 2005 she was Visiting Professor at the Dana Farber Cancer Institute, Harvard Medical School, Boston, USA. She has published more than 25 papers in reputed journals, she is member of several international scientific societies and reviewer for different well recognized journals.