

A Microfluidic Study of the Interaction of Haematopoietic Stem Cells with their Microenvironment

Maximilian Hanke^{1,2}, Christof Christophis^{1,2}, Christina Leinweber^{1,2}, Natalia Baran³, Isabel Taubert³, Patrick Wuchter³, Anthony Ho³, Axel Rosenhahn^{1,2}

1: Institut für funktionelle Grenzflächen Karlsruher Institut für Technologie (KIT), PO Box 3640, 76021 Karlsruhe, Germany

2: Angewandte Physikalische Chemie, Ruperto Carola Universität Heidelberg, Im Neuenheimer Feld 253, 69160 Heidelberg

3: Universitätsklinikum Heidelberg, Innere Medizin V, Im Neuenheimer Feld 410, 69120 Heidelberg

A microfluidic adhesion assay has been developed to quantitatively investigate the interaction of cells with interfaces under well defined flow conditions.^[1] The device was applied to the study of the interaction of leukaemic cells and haematopoietic stem cells with hyaluronic acid surfaces. We found that beyond a critical shear stress the cell surface receptor CD44 mediates a catch bond, flow induced rolling of the cells on the surfaces^[2], similar as observed for leukocytes during the extravasation process.^[3] A similar rolling phenomenon occurred on mesenchymal stroma cells, which are present in the bone marrow niche creating the microenvironment required for haematopoietic stem cells to endlessly proliferate. The mesenchymal stroma cells inter alia secrete the stroma-cell-derived factor-1 alpha which has been reported to activate stem cell migration, mobilization and homing.^[4] The effect of this chemokine on the movement of haematopoietic stem cells was also studied utilising a novel microstructured niche model.

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