Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Microfluidic model of the platelet-generating organ: beyond bone marrow biomimetics MATHILDE REYSSAT, ESPCI/UMR Gulliver, Paris, France, ANTOINE BLIN, PlatOD, Paris, France, ANNE LE GOFF, UTC, CNRS, UMR 7338, Compigne, France., AURELIE MAGNIEZ, PlatOD, Paris, France, SONIA POIRAULT-CHASSAC, UMR S1140, Inserm, Paris, France, BRUNO TESTE, ESPCI/UMR Gulliver, Paris, France, GERALDINE SICOT, PlatOD, Paris, France, KIM ANH NGUYEN, Inserm U1148 LVTS, Paris, France, FERIEL S. HAMDI, PlatOD, Paris, France, DOMINIQUE BARUCH, UMR S1140, Inserm, Paris, France — We present a new, rapid method for producing blood platelets in vitro from cultured megakaryocytes based on a microfluidic device. This device consists in a wide array of VWF coated micropillars. Such pillars act as anchors on megakaryocytes, allowing them to remain trapped in the device and subjected to hydrodynamic shear. The combined effect of anchoring and shear induces the elongation of megakaryocytes and finally their rupture into platelets and proplatelets. This process was observed with megakaryocytes from different origins and found to be robust. This original bioreactor design allows to process megakaryocytes at high throughput (millions per hour), with a platelet yield increasing four times in comparison with control experiments. Since platelets are produced in such a large amount, their extensive biological characterization is possible. Fluorescent microscopy observations, flow cytometry, aggregometry results indicate that platelets produced in this bioreactor are functional.

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Date submitted: 30 Jul 2015 Electronic form version 1.4