

**A micro-bead device to explore Plasmodium falciparum-infected, spherocytic or aged red blood cells prone to mechanical retention by spleen endothelial slits**

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Guillaume Deplaine, Innocent Safeukui, Fakhri Jeddi, François Lacoste, Valentine Brousse, et al.. A micro-bead device to explore Plasmodium falciparum-infected, spherocytic or aged red blood cells prone to mechanical retention by spleen endothelial slits. *Malaria Journal*, BioMed Central, 2010, 9 (Suppl 2), pp.O10. 10.1186/1475-2875-9-S2-O10 . inserm-00617223

**HAL Id: inserm-00617223**

**<https://www.hal.inserm.fr/inserm-00617223>**

Submitted on 26 Aug 2011

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# A micro-bead device to explore *Plasmodium falciparum*-infected, spherocytic or aged red blood cells prone to mechanical retention by spleen endothelial slits

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From Parasite to Prevention: Advances in the understanding of malaria  
Edinburgh, UK. 20-22 October 2010

Experimental tools to identify human red blood cells (RBC) prone to mechanical retention upstream from the spleen venous sinus inter-endothelial slits are currently suboptimal. We designed a micro-bead device mimicking the geometry of the human narrow and short inter-endothelial slits. Upon filtration through a mixture of 5-25 µm diameter micro-beads, *Plasmodium falciparum*-hosting RBC (Pf-RBC) were retained in a parasite developmental stage-dependent way, the retention rates of a subset of ring-RBC being similar in micro-beads and in isolated-perfused human spleens. We found that this retention might be linked principally to the reduced surface-area-to-volume ratio of Pf-RBC. Interestingly, other rigid RBC, such as heat-treated RBC, and RBC from hereditary spherocytosis patients were also retained in micro-beads without any hemolysis. Micro-beads allow (i) depletion of heterogeneous RBC population from its rigid-RBC subpopulation ii) characterization of distinct molecular signatures of rigid versus deformable RBC subpopulations. This simple method portends wide medical applications, such as

improving the quality of stored RBC concentrates prior to transfusion.

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Published: 20 October 2010

doi:10.1186/1475-2875-9-S2-O10

**Cite this article as:** Deplaine et al.: A micro-bead device to explore *Plasmodium falciparum*-infected, spherocytic or aged red blood cells prone to mechanical retention by spleen endothelial slits. *Malaria Journal* 2010 **9**(Suppl 2):O10.

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