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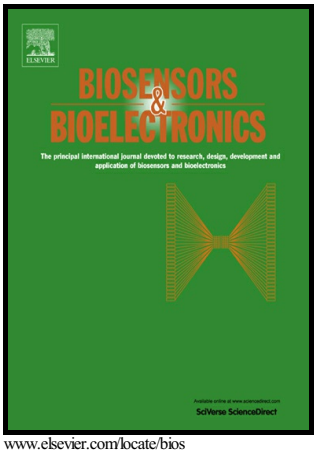

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High-throughput and label-free parasitemia quantification and stage differentiation for malaria-infected red blood cells

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Abstract

This work reports a high throughput and label-free microfluidic cell deformability sensor for quantitative parasitemia measurement and stage determination for *Plasmodium falciparum*-infected red blood cells (*Pf*-iRBCs). The sensor relies on differentiating the RBC deformability (a mechanical biomarker) that is highly correlated with the infection status. The cell deformability is measured by evaluating the transit time when each individual RBC squeezes through a microscale constriction (cross-section ~5μm×5μm). More than 30,000 RBCs can be analyzed for parasitemia quantification in under 1 min with a throughput ~500 cells/s. Moreover, the device can also differentiate various malaria stages (ring, trophozoite, and schizont stage) due to their varied deformability. Using *Pf*-iRBCs at 0.1% parasitemia as a testing sample, the microfluidic deformability sensor achieved an excellent sensitivity (94.29%), specificity