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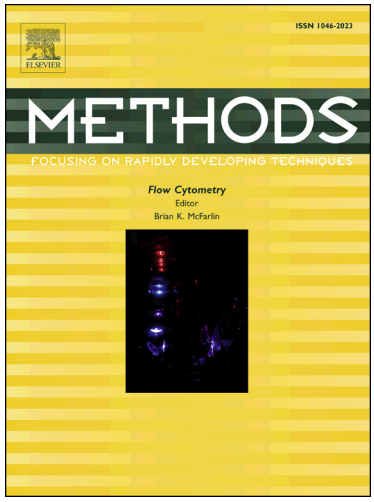

Individual sperm selection by microfluidics integrated with interferometric phase microscopy

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Individual sperm selection by microfluidics integrated with interferometric phase microscopy

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Abstract

The selection of sperm cells possessing normal morphology and motility is crucial for many assisted reproductive technologies (ART), especially for intracytoplasmic sperm injection (ICSI), as sperm quality directly affects the probability of inducing healthy pregnancy. We present a novel platform for real-time quantitative analysis and selection of individual sperm cells without staining. Towards this end, we developed an integrated approach, combining interferometric phase microscopy (IPM), for stain-free sperm imaging and real-time automatic analysis based on the sperm cell 3D morphology and contents, with a disposable microfluidic device, for sperm selection and enrichment. On testing the capabilities of the microfluidic device, we obtained successful selection of sperm cells with a selectivity of 89.5±3.5%, with no negative-decision sperm cells being inadvertently selected. In addition, we demonstrate the accuracy of sperm cell analysis using IPM by comparing the quantitative analysis produced