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Pre-isolation in lab-on-chip of adipose stem cells (ASCs) from complex biological samples

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Adipose tissue is a rich source of multipotent stem cells: Adipose Stem Cells (ASCs), which are of considerable interest for regenerative medicine or type II diabetes diagnosis. They are known to migrate and circulate in lymph and the hypothesis of their circulation in blood is not excluded. No method exists to isolate them from blood. We propose an original LOC (Lab-On-Chip) that aims at isolating ASCs from blood by using passive methods. As ASCs do not present any specific physical characteristic, different complementary steps are necessary: our device combines two methods. This study presents the first step, based on hydrodynamic filtration, which aims at eliminating biological elements with a diameter below $10\mu\text{m}$. Tests were conducted on

mixed samples of Red Blood Cells (RBCs) and ASCs. We showed that the filtration rate depends on the ratio of the concentration of cells in the sample. For a ratio equal to $1.8e2$, the rate of monocytes recuperated is 100% and the rate of RBCs filtrated is 45.3%. For a higher ratio, equal to $1.3e4$, the rate of monocytes recuperated is still 100% but the rate of RBCs filtrated is 55.8%. ASCs recuperation is not impacted by the composition of the sample. On the contrary, RBCs filtration is influenced by the composition of the sample. We showed the capability of the hydrodynamic separation LOC to efficiently pre-isolate adipose stem cells from complex samples without damaging cells.

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