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Finger prick blood plasma separation using a standard lab equipment

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Blood plasma contains many analytes, biomarkers and pathogens that have a huge diagnostic value. Nowadays, the analysis is performed on a venous blood sample that is centrifuged in order to separate the plasma from blood cells. Such a centrifugation approach is a gold standard in the current plasma analysis resulting in the highest quality and amount of liquid to be analyzed. Lately, there have been a lot of reports on a miniaturization of blood sample preparation with main focus on paper-based, lab-on-a-disc or membrane-based devices [1,2]. As pointed out by recent review papers the sample handling in microfluidics is one of the key challenges for commercialization of analytical microfluidic devices [1,2]. The reported miniaturized blood handling devices often require blood dilution, which reduces the amount of analytes available for analysis. Moreover, they use low flow rates, which greatly affects the separation time and their application in commercial systems.

We present here a microfabricated polymer device for separation of plasma from whole blood collected from a finger prick. The device fits in a standard 1.5 ml eppendorf tube and is mounted in a tabletop laboratory spinner. The whole blood sample of 10-20 μ l is layered over pre-loaded Ficoll paque[®] that is used for density gradient separation of plasma and white blood cells. After 2 min spinning the plasma and white blood cells are efficiently separated from red blood cells that are collected at the channel bottom. The device allows for handling and reading of various hematocrit levels. After separation the plasma and white blood cells are pipetted or pushed out of the device with a specially designed flexible chamber. The quality of the separated plasma was validated using spectrophotometric methods for assessing the amount of proteins and the hemolysis. This simple to operate device is amenable for integration with various biosensor platforms for detection of specific analytes.



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