Finger prick blood plasma separation using standard lab equipment

Kwasny, Dorota; Andersen, Karsten Brandt; Pfreundt, Andrea; Levinsen, Simon; Svendsen, Winnie Edith

Publication date:
2014

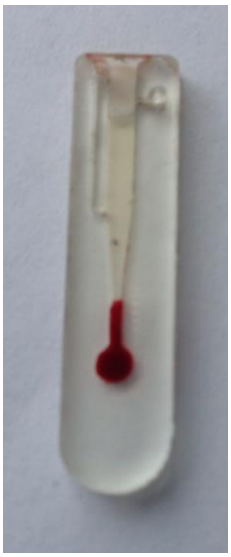
Document Version
Publisher's PDF, also known as Version of record

Finger prick blood plasma separation using a standard lab equipment

Dorota Kwasny[a], Karsten B. Andersen[a], Andrea Pfreundt[a], Simon Levinsen[a] and Winnie E. Svendsen[a]

a-Technical University of Denmark, Kgs. Lyngby, Denmark
b-DELTA, Hørsholm, Denmark
dorota.kwasny@nanotech.dtu.dk

Blood is a complex biological matrix that has a huge potential for diagnostics as it contains various analytes and biomarkers. Traditionally the analysis is performed on plasma and white blood cells separated from venous blood. However, the collection of venous blood samples is painful and requires a few milliliters of blood. It has been demonstrated that the blood taken from finger prick contains the same analytes as venous blood in sufficient abundance and could therefore be used for diagnosis as an alternative in many cases. Various approaches towards analysis of finger prick blood with plasma separation and analyte detection on-chip are reported in the literature [1]. Although versatile, these plasma separation techniques often require sample dilution prior to separation and use low flow rates resulting in longer processing times which greatly hinders their use in commercial systems.



Here we present a device for analysis of minute blood volumes using a standard laboratory tabletop spinner. The microfabricated polymer device fits in a 1.5 mL eppendorf tube and takes between 10-20 µl of whole blood. The blood is layered over a pre-loaded Ficoll paque® that is used to separate the plasma and white blood cells for further analysis. The procedure requires 2 min spinning and can efficiently separate the plasma and white blood cells from red blood cells. The device allows for handling blood with varying hematocrit levels readout of which is included in the device design. After separation the plasma and white blood cells are simply pipetted or pushed out of the device by pressing a flexible chamber. Plasma quality is assessed by spectrophotometry to determine the amount of proteins in the extracted plasma and the degree of undesired hemolysis.

References:

1. Maiwenn Kersaudy-Kerhoas and Elodie Sollier, 'Micro-scale blood plasma separation: from acoustophoresis to egg-beaters', Lab on a Chip, 2013, 13, 3323-3346