Electronic Supplementary Material (ESI) for Lab on a Chip.

Electronic Supplementary Information

Influence of varying mixing time on DNA yield in manual workflow

To determine the influence of mixing time on DNA yield in the manual workflow with the kit NucleoSpin® Blood Quick Pure (Macherey Nagel, Germany, cat. no. 740569.250), the duration of vortexing is varied between 0 seconds (no vortexing) and 20 seconds (reference). For all experiments, a total incubation time for lysis of 10 minutes is applied. The remaining workflow is performed according to the manufacturer's protocol and DNA concentration is determined by measuring 2 µl of the eluate on a NanoVue Plus Spectrophotometer (GE Healthcare Lifesciences). The results are shown in Figure 1. Without mixing, about 45% of the yield of the reference workflow is achieved, which is significantly

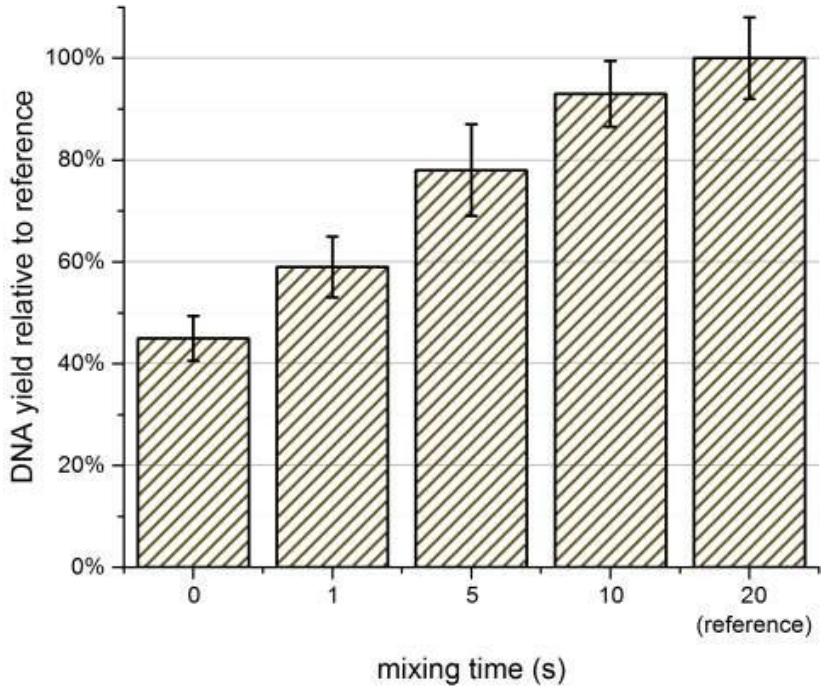

Figure 1: The mixing time in the manual workflow was changed between 0 s (no mixing) and 20 s.

higher than for the configuration of "no mixing" studied on the LabDisk. This is most likely due to the fact that on the LabDisk the sample is constantly subjected to centrifugation which promotes sedimentation of the DNA carrying cells. This can on the one hand hamper the lysis of these cells and on the other hand sterically trap the released DNA in the cell pellet. By applying vortexing of increasing duration, the DNA yield steadily increases. This demonstrates that mixing is of great importance in order to extract as much DNA as possible from the blood sample and makes it plausible to use DNA yield to assess mixing quality.

Temporal development of grey scale distribution during mixing

For buoyancy driven bubble mixing at 46·g, a grey scale distribution has been measured during mixing. In the beginning, the blood and the lysis buffer can be clearly distinguished as the blood is black in the monochrome image while the lysis buffer is light grey (compare Figure 2). After 5 seconds, the distinct separation is already largely gone and after 13 s a homogeneous grey scale distribution is achieved as indicated by the right hand image in Figure 2. At the same time, the DNA yield when mixing for 100 s is only 59 ± 13 % of the reference workflow as discussed in the section "Quantification of mixing efficiency" in the main text of the article. This further emphasizes that grey scale distribution is not a good predictor of the mixing performance, at least for cell lysis of human blood cells for genomic DNA.

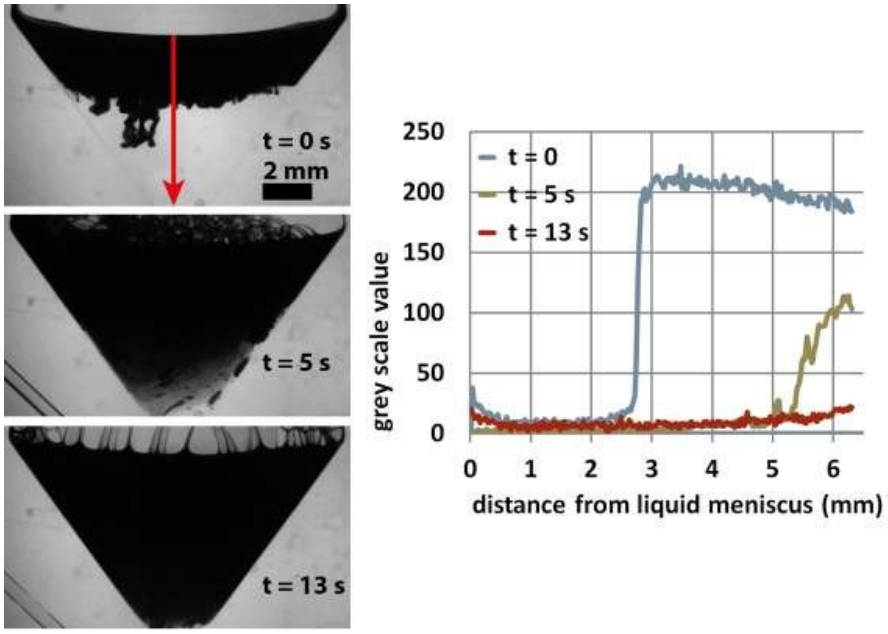

Figure 2: The left hand images show blood (black) and lysis buffer (light grey) before and after applying buoyancy driven bubble mixing at 46·g. The right hand image shows the grey scale distribution at all three times measured along the arrow depicted in the upper left image. It is clearly visible, that homogeneity in grey scale distribution has been reached after 13 s of mixing.