Automated Sample Preparation of Whole Blood – The Need for Speed

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Conclusion
A fast, automated sample preparation method of fresh whole blood samples was developed and is used in routine analysis of immunosuppressive drugs (ISDs) and phosphatidylethanol (PEth).

Background
ISDs and PEth require whole blood sample preparation. This is challenging for automation as blood cells sediment with time. Freezing, alternatively mixing blood with tips etc. is too slow and would affect turnaround times for urgent samples1,2,3. The impact of sedimentation rate on correct concentration measurements was therefore investigated.

Method
Eight fresh whole blood samples that clocked the fastest sedimentation rates out of 128 were selected. Primary tubes were placed in sample racks and homogenized on a rocking platform; decapped, then pipetted with a non-standard 10 mm subsurface aspiration at 0, 1, 3, 5-minutes and so on, using the Hamilton STARlet automation platform. Initial aspiration was considered equal to manual aspiration and analyte concentration was chosen as deciding factor.

Results
With a 10 mm subsurface aspiration, loading of racks and subsequent pipetting of homogenized samples must be completed within 9 minutes (Fig. 1). Sample concentrations did not deviate significantly between the initial and 9-minute pipetting intervals. The robot was able to process two full 24-sample racks within 7.5 minutes on average. Comparison of automated sample preparation with manual preparation of ISDs and PEth showed equal or better accuracy and precision.

Discussion
Rocking fresh whole blood samples in racks prior to a 10 mm subsurface aspiration can replace time-consuming freezing or mixing with tips. The automation method is fast and has high sample-throughput. This, combined with a labware information system (LIMS) connection, contributes to overall process safety compared to manual sample handling (Fig. 2). It is also more ergonomic for laboratory personnel and frees up resources. The method is however not suitable for small sample series.