

Versatile platform for fully automated sample preparation of forensic whole blood for LC-MS analysis

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Recent developments in LC-MS instrumentation continue to improve the throughput and possibilities in the field of LC-MS analysis. However, before actual analysis is possible, sample preparation is required which is often a time-consuming process, especially when analyzing complex biological matrices such as whole blood.

Here we present our robotic solution for efficient and fully automated sample preparation of forensic whole blood. The platform, built around a Tecan Freedom EVO liquid, is equipped with extra devices such as a balance, centrifuge, vacuum manifold and evaporator. The platform is capable of performing all steps involved in typical sample preparation procedures such as solid phase extraction (SPE) and protein precipitation (PPT).

Forensic whole blood and especially post mortem samples present an additional challenge in automation as they vary greatly in terms of amount, viscosity and clots and hence are difficult to pipet. Correct and traceable handling of whole blood is crucial and ensured by an incorporated balance. Every aliquot of whole blood is weighed when pipetted from primary tube to a 96-well plate on the balance. The pipetting step is automatically repeated for samples where too little blood is transferred initially, e.g. due to a clogged tip.

Using the platform, whole blood from 96 primary tubes is efficiently processed into injection ready extracts in a couple of hours. This time includes all steps typically included before and during the actual sample preparation, including barcode reading, weighing aliquots of whole blood, addition of internal standard, preparation of calibrators, pretreatment with dilution and centrifugation, actual SPE steps, evaporation of eluate and finally reconstitution.

The platform is in routine use and performance results from pipetting of thousands of authentic ante mortem and post mortem whole blood samples will be presented. Versatility of the platform is displayed with examples of validated methods including toxicological screening and quantification of drugs of abuse in whole blood.