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Fully Autonomous Processing and Analysis of Dried Blood Spots Collected by Volumetric Absorptive Microsampling

Pavel Kubáň[1], Miloš Dvořák[1], Richard Maršala[1], Noemí Aranda-Merino[1,2]
[1]Institute of Analytical Chemistry, Czech Academy of Sciences, Brno, Czech Republic, kuban@iach.cz
[2]Department of Analytical Chemistry, Faculty of Chemistry, University of Seville, Seville, Spain

Summary

Dried blood spot (DBS) processing is usually based on sub-punching a small DBS section and might have a direct consequence on quantitative DBS analyses [1]. Simple, flexible, and user-friendly volumetric absorptive microsampling (VAMS) devices were, therefore, introduced for accurate DBS collection recently. These devices transfer an exact blood volume onto a sampling sorbent, use the whole DBS for subsequent processing/analysis, and have proven to be suitable for remote patient-centric DBS collection and quantitative clinical analysis [2].

DBS processing typically requires transformation from a dry to a liquid sample, however, commercial instruments for DBS processing are not compatible with the new VAMS devices. All clinical assays of DBSs collected by VAMS are, thus, based on manual or semi-automated processing and analyses. They are tedious, labour- and time-intensive, prone to processing errors, and there is an urgent quest for the development of simple and cheap solutions for unmanned pretreatment and analyses of DBSs collected by VAMS.

One such solution was recently developed in our laboratory. A single, off-the-shelf capillary electrophoresis (CE) instrument was employed for executing all tasks of the analytical protocol and the actual contribution will summarize fundamentals and the most recent applications of the novel concept for the autonomous quantitative CE analyses of DBSs collected by VAMS. The proposed concept enabled high-throughput analyses (several hundred DBS samples per day) and its suitability was exemplified by the determination of endogenous clinical markers (e.g. organic ions and amino acids) in DBS samples. This concept represents a progressive analytical tool for personalized healthcare, screening populations at risk, and can be also useful in critical (e.g. pandemic) situations. Besides, it can be easily extended to the determination of a wide range of analytes in various dried biological materials and might, thus, play an important role in clinical, toxicological, and forensic analyses in the future.

Acknowledgement

Financial support from the Czech Science Foundation (Grant No. 23-05972S) and the Czech Academy of Sciences (Institute Research Funding RVO:68081715) is gratefully acknowledged.

References

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