Development of standard operating procedures to support exhaled breath analysis in a clinical environment.

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Abstract

Exhaled breath analysis is a fast-growing field of research in respiratory medicine. However, the volatile nature of the breath matrix makes its characterization a true analytical challenge. The high variability of techniques used for breath screening prevents any study comparisons.

In this study, we aim to establish standard operating procedures (SOPs) to develop robust breath analytical workflows. Global SOPs will facilitate staff training and minimize external variabilities. In addition, it should facilitate study comparison by clearly identifying the impact of the analytical methods on the results.

To evaluate the impact of the different steps occurring during exhaled breath analysis, we have developed an artificial breath mixture, combining a group of chemicals usually detected in breath. This artificial breath was used for method development and QAQC monitoring. In addition, we used the “Peppermint initiative” experiment to confirm our results on a controlled exhaled breath experiment.

We have applied our methods to improve our established breath sampling protocols by developing ready to use sampling kits to be used in clinics. Our method allows us identifying the critical during sampling and analysis steps (i.e., bag cleaning cycle, storage time…). Next, we have extended the scope of our methods to compare other sampling technologies. We have evaluated the impact of key parameters such as breath volume, breath fraction… on the global profile and target compounds.

In conclusion, the combination of artificial breath and controlled breath experiments allow establishing robust SOPs and provides valuable indicators for sampling method selection and development.