

# Introduction

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Breath testing has existed in medical practice for centuries; for example, the sense of smell of patients with advanced renal or hepatic diseases. Breath testing has come a long way from ancient knowledge and anecdotal reports to cutting-edge research and the current clinical applications within the field. At present, exhaled biomarker measurements range from the US Food and Drug Administration approved use of exhaled nitric oxide fraction ( $F_{eNO}$ ) to the determination of volatile organic compounds (VOCs) and the profiling of exhaled breath condensate (EBC) constituents. Being completely noninvasive, sampling of the breath allows clinicians and researchers to assess different body functions in a convenient and flexible way. The vast majority of constituents suggested as biomarkers are present in trace amounts, making detection a challenging task. The application of highly sensitive cutting-edge technologies in sample analysis, including proteomics, metabolomics, mass spectrometry, gas chromatography–mass spectrometry and ion mobility spectrometries, has provided major advancements and offers great potential for the field of exhaled biomarker profiling. However, due to the increasing sensitivity of new detection techniques the purity of the samples is becoming a major hurdle.

Exhaled breath biomarkers have been assessed to understand pathological mechanisms and to aid clinical decision making of extensively different diseases, including asthma, chronic obstructive pulmonary disease, lung cancer and systemic diseases. Entirely different strategies have been implemented for both purposes, including the determination of individual biomarkers and the recognition of signal patterns created by undefined compounds. In order to establish exhaled biomarkers in clinical practice they have to be validated just like any other biomarker and, to date, only a few have been put through the necessary steps.

This issue of the *European Respiratory Monograph (ERM)* provides a state-of-the-art summary of this rapidly progressing field. Our aim was to introduce the topic beginning with the best known biomarker,  $F_{eNO}$ , then moving on to carbon monoxide, exhaled VOCs and the wide range of EBC biomarkers. We, as Guest Editors, are grateful to the authors for putting together chapters with detailed information of the different aspects of exhaled biomarker measurements covering everything from pathophysiological issues through methodological issues to clinical applications and implications. The authors not only cover current knowledge and provided an elegant selection of references but also express their opinions, and highlight the unknown aspects and the need for future research. We greatly enjoyed putting together the content for this *ERM* and the interaction we experienced with the authors. Our aim is to lead the reader through the different exhaled biomarkers by providing information relevant both at bench and bedside. We hope that you will find new and relevant information regardless of whether you are just starting to study this exciting field or already have vast experience in it.

We wish you an enjoyable journey when reading this issue of the *ERM* and hope that you will not only use the information provided but will also form questions and comments, and conduct some research that will facilitate further improvement in the field.