

## Contents

<b>Introduction</b>	<b>3</b>
Scope of this Guide	3
Introducing Breathomics	3
Components of Breath	4
Non-invasive Biomarkers	5
Historical Breath Analysis	5
Breath Analysis in the Modern Era	7
Established VOC Breath Tests	8
VOC Analysis in Clinical Trials	8
Biomarkers in Respiratory Droplets	9
<b>What are VOCs?</b>	<b>11</b>
Where do Breath VOCs Originate?	12
<b>VOCs as Biomarkers</b>	<b>17</b>
Metabolomics vs. Genomics	17
Metabolomics in Diagnosis & Precision Medicine	18
Whole Body Sampling via Breath	18
Breath Biopsy vs. Liquid Biopsy	21
Monitoring Changes in Breath VOCs Over Time	22
Untargeted & Targeted Approaches	24
<b>Applications of VOC Biomarkers</b>	<b>25</b>
Wide Disease Relevance	26
Novel Biomarkers	27
Precision Medicine	27
Clinical Trials Patient Matching	29
Drug Metabolites and Disease Monitoring	29
Early Detection and Screening	29
Breath Biopsy for Exposomics	30
<b>VOC Application Case Studies</b>	<b>33</b>
Asthma	34
Chronic Obstructive Pulmonary Disease (COPD)	41
Pulmonary Hypertension	43
Cancer	46
Inflammatory Diseases	54
Liver Diseases	57
Infectious Disease	65
Selected Other Conditions	69
<b>How to Analyze VOCs</b>	<b>73</b>
Making Progress in Breath Sampling & Analysis	74
Study Design	75
Breath Analysis Workflow	78
Reliable Collection of Breath Samples	78
VOC Biomarker Identification	81
FAIMS for Targeted VOC Analysis	82
EVOC® Probes	83
Example Research Applications of EVOC Probes	84
Quality Control	87
Data Analysis	89
<b>Breath Biopsy Products &amp; Services</b>	<b>93</b>
Integrate Breath Biopsy into your Clinical Trial	94
Breath Collection	94
Breath Analysis	95
<b>Further Reading</b>	<b>99</b>
<b>References</b>	<b>100</b>