Introducing “BiomeOne”, a microbiome-based biomarker to predict immune checkpoint inhibitor response in NSCLC patients

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INTRODUCTION

- Immune checkpoint inhibitor (ICI) therapies have emerged as a potent option for the treatment of non-small cell lung cancer (NSCLC). Major downsides of ICI-treatments are the varying response rates and sometimes even severe immune related adverse events (irAE).
- BiomeOne® is a tumor-agnostic CE-IVD marked medical device that uses baseline stool samples to analyse the intestinal microbiome and predict patient response. The aim of our study was to evaluate the prognostic potential of BiomeOne® in a cohort of NSCLC patients.

METHODS

- Over the last few years, the scientific team of Biome Diagnostics has worked on establishing a specific biomarker that utilises the genomic data from the human intestinal microbiome as a response predictor for ICI therapy.

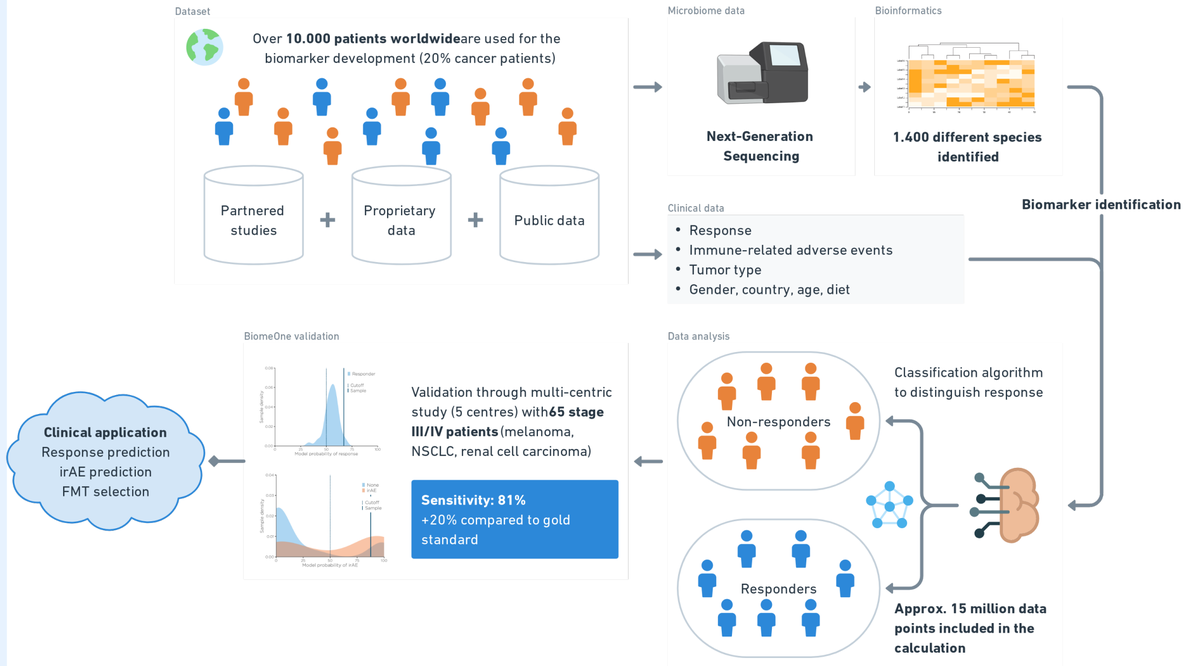

Figure 1. Schematic representation of biomarker development (=training dataset).

RESULTS

- The BiomeOne® test had on overall **sensitivity of 81% and a specificity of 55%** in our NSCLC cohort. From the 31 patients classified as R after ICI treatment, BiomeOne® correctly identified 25 patients based on the microbial profile of the baseline stool samples, prior to therapy initiation.

Table 1. Descriptive statistics of the NSCLC cohort included in the validation study.

Descriptive statistics		NSCLC cohort
Age	Mean	64.86
	SD	9.33
Sex	F	17
	M	25
Stage	3	11
	4	31
Response	R (CR + PR)	31
	NR (SD + PD)	11
irAE	No	21
	Yes	21

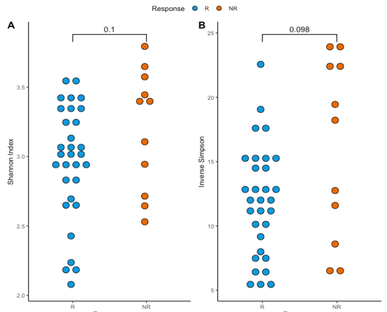

Figure 2. No differences in alpha-diversity (A - Shannon index, B - inverse Simpson) were found between R and NR.

Table 2. Differentially abundant bacteria between R and NR found with ALDEx2.

Taxonomy	ALDEx2 (t-test)	ALDEx2 (Wilcoxon rank sum test)
g_Sutterella	**0.01**	**0.01**
g_[Eubacterium] eligens group	**0.01**	0.11
o_Gastranaerophilales	**0.03**	**0.03**
g_Haemophilus	0.05	**0.02**
g_Faecalibacterium	0.05	0.23
g_Lachnospiraceae UCG-010	0.06	**0.04**

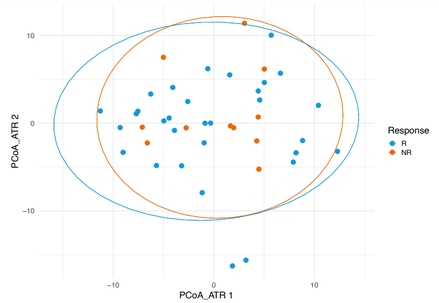

Figure 3. Robust Aitchison on species level data. No significant differences (PERMANOVA, P = 0.15) found between R and NR.

DISCUSSION

The presented research will give oncologists a clinical support tool to aid in therapy decision making. With this biomarker ICI therapies will be applied in a more targeted manner, improving patient well-being and recovery. Additionally, presented research will show that the large number of included datasets lead to a robust biomarker taking into account multiple confounding factors such as sample preparation and analysis methods.

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