Bio-Me AS

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Positioning Microbiome Analysis for Precision Medicine

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Microbiome Analysis in Precision Medicine

Challenges & Needs

- Trade-off (16S vs Shotgun)

- Long, complex process

- Lab-dependent results

- Resolution for actionable results

- Rapid, high throughput

- Standardized procedure

# Collaboration with Thermo Fisher Scientific

- TaqMan™ - Gold standard in bacterial detection
- OpenArray® - Unique technology allows analysis of 12K independent assays & ~ 200 samples in one run (less than 2 hours)
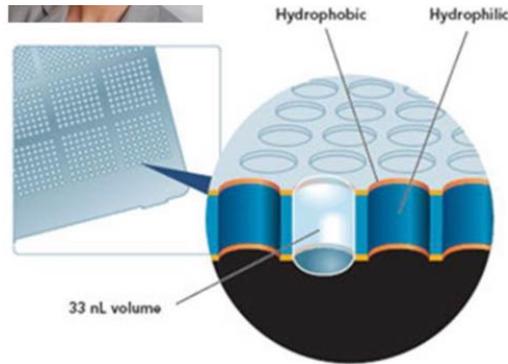
Performance of OpenArray

High reproducibility
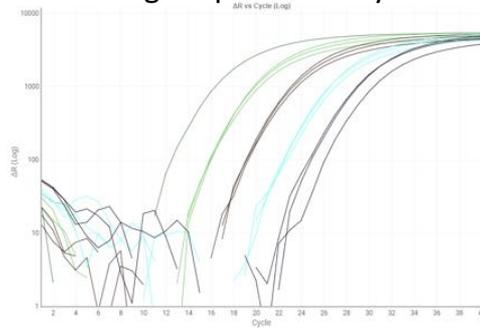
Clean amplification curves
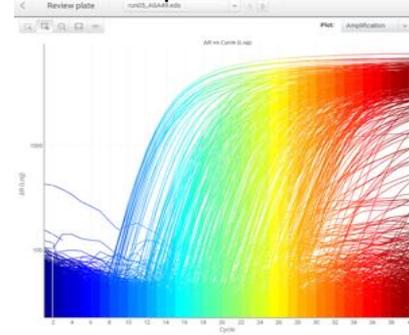
5 – 6 log dynamic range
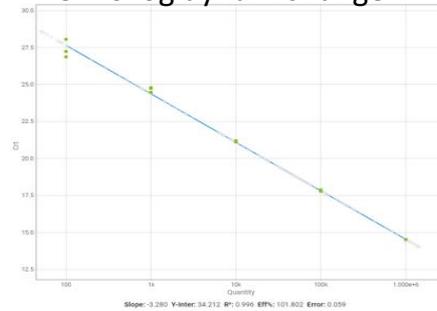
Accurate quantification
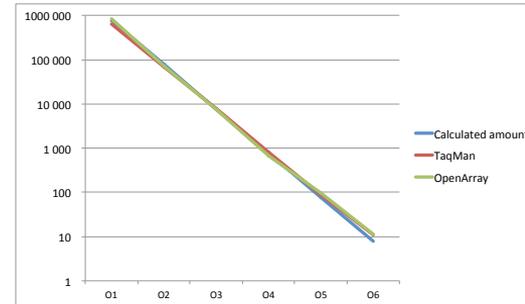
Subjects

Demonstration study – Precision Microbiome Profiling (PMP)

A

B

C

4 weeks:
Normal diet

4 weeks:
Change of diet

30 bacteria panel
"Daily" sampling
OpenArray analysis – 465 samples in one day
Statistical analysis of data

Interventions:

A: More fruit and vegetables, fiber supplement

D

B: No meat, fiber supplement

C: Lactoferrin supplement

D: No meat and sweets

E

E: Increase protein, decrease fiber

Rapid and high throughput analysis process
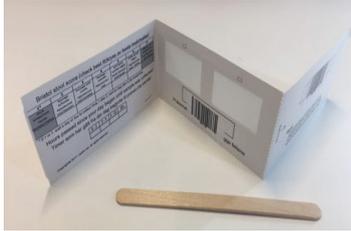
Sample Collection Kit

Sample (punch)

Punching

Bead-beating

**DNA purification**
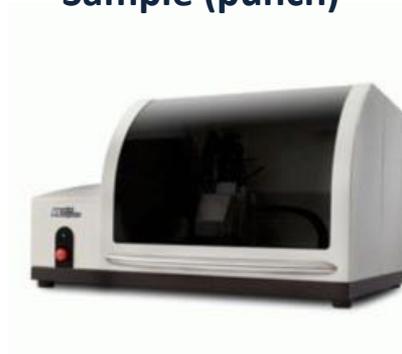

Sample loading


Analysis

Database & Report

Demonstration study PMP – Reproducibility
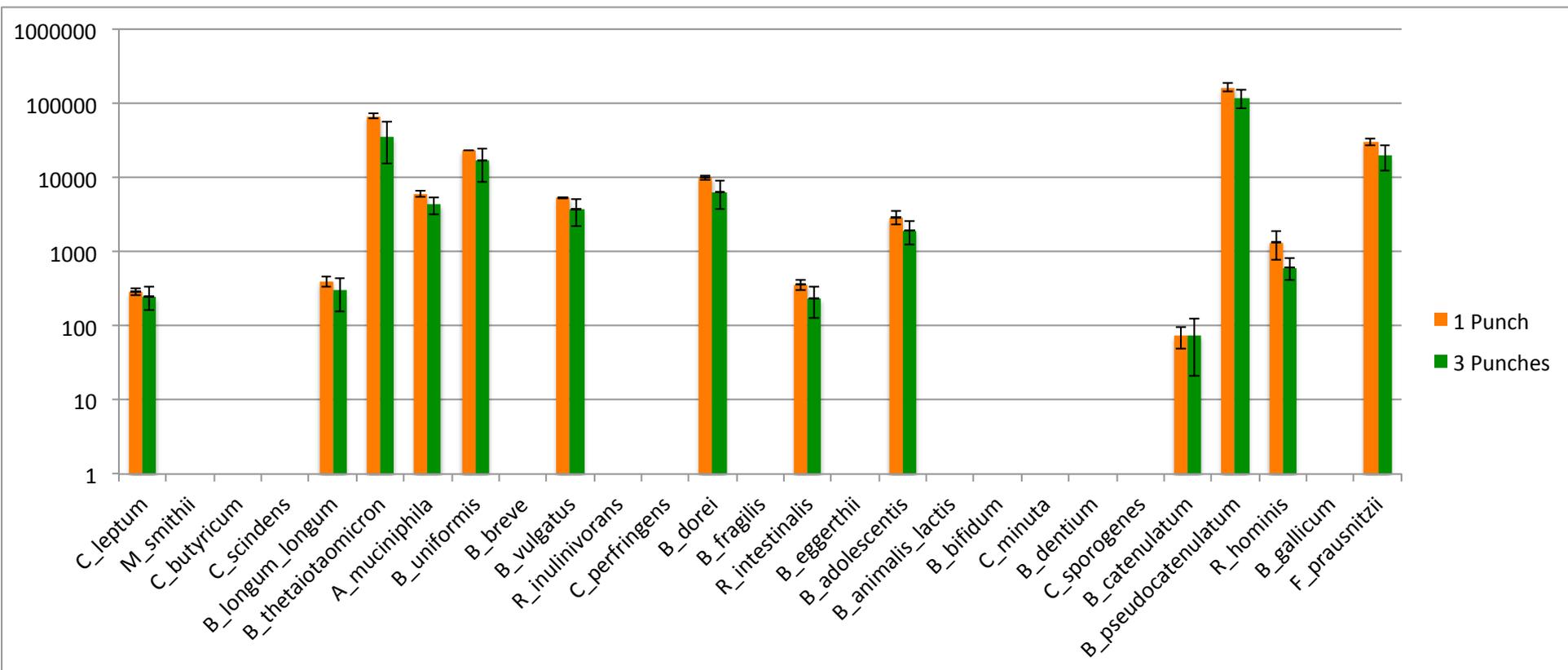
Demonstration study PMP – PCA all bacteria

Bidifobacterium adolescentis

Bacteroides thetaiotaomicron

Akkermansia muciniphila

Roseburia hominis
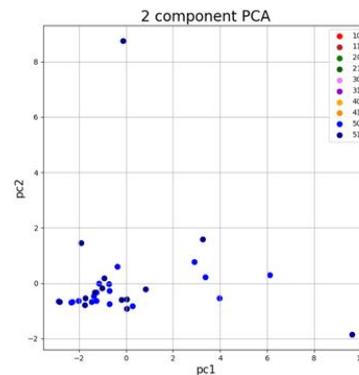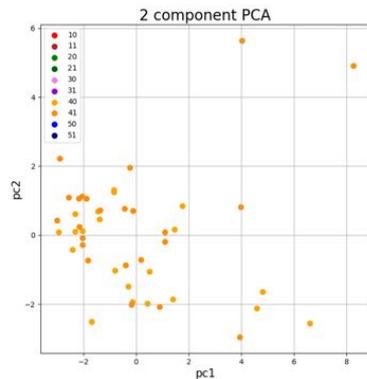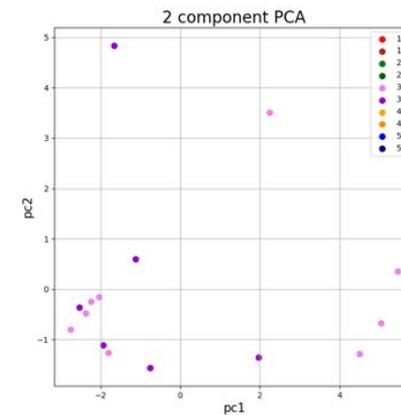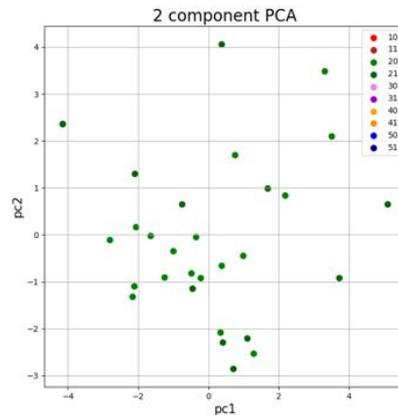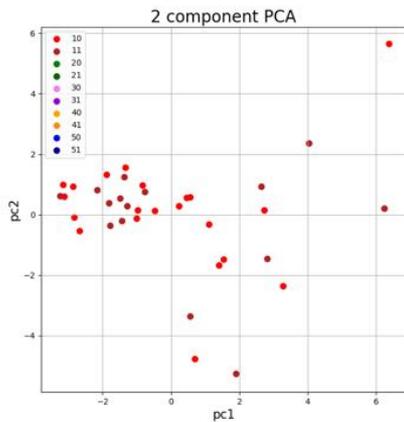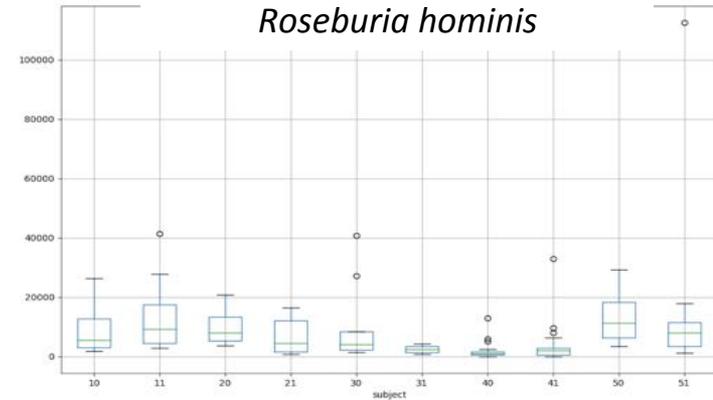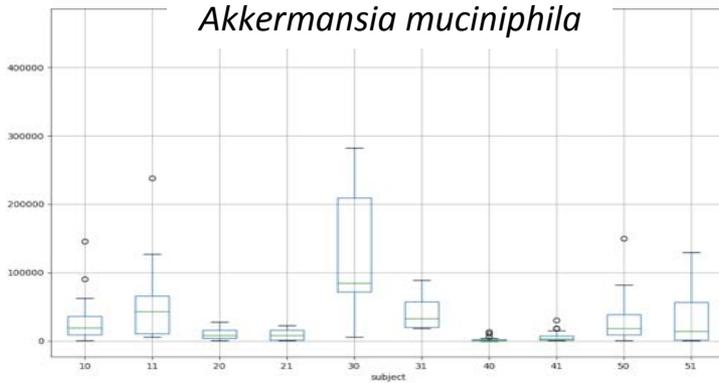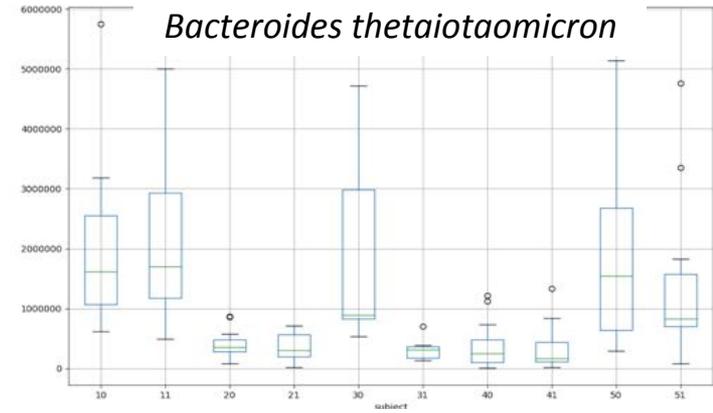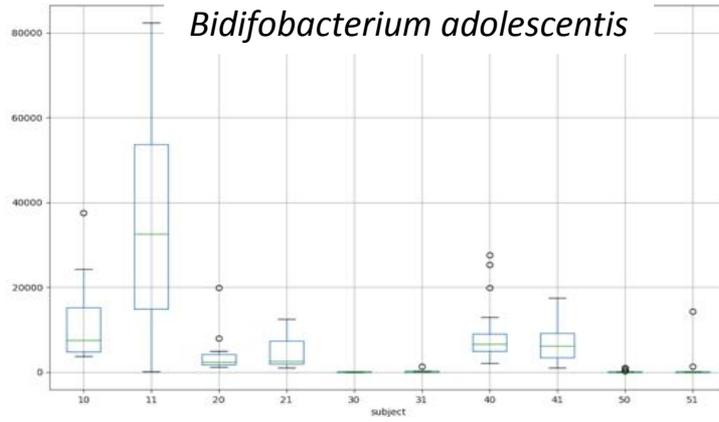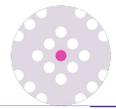
Demonstration study PMP – Lessons learnt

- Although overall changes may be difficult to detect, high resolution analysis shows significant changes in quantities of specific bacterial species

- Changes in species abundance within 1 – 3 days

- After initial change in abundance, tendency to rebound to pre-intervention levels

- Although small panel of bacteria, PMP provided important and significant insight to microbiome profiles

PMP – Precision Microbiome Profiling platform

- **Comprehensive**   100+ of the most important/common gut bacteria

- **High resolution**   Species and strain level identification

- **High throughput**   Hundreds of samples in less than one day

- **Direct quantification**   Quantify actual number of bacteria in sample

- **Rapid & cost-effective**   Less than one day

World-class database

HUNT 4
20,000 subjects
6,000+ health
parameters

National Health
registries

PMP
Precision
Microbiome
Profiling platform

Bio-Me
Database

Predictive
modeling

Better
health,
wellness,
longevity
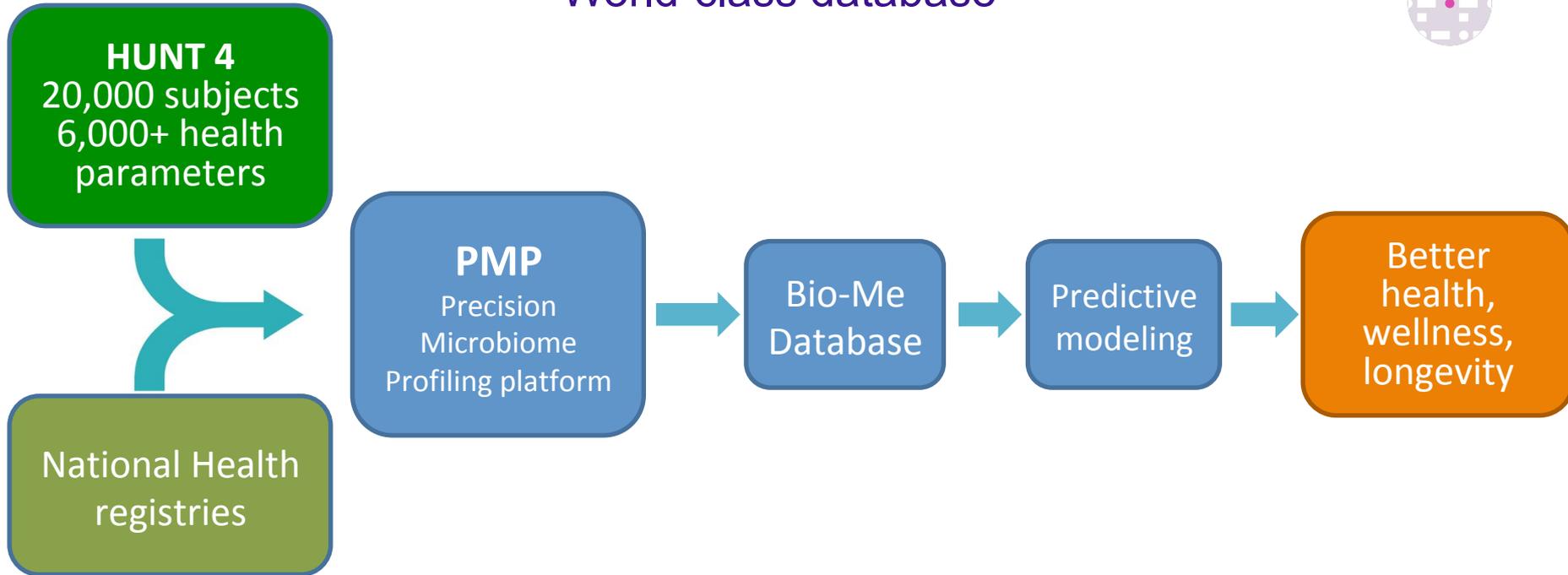
Beyond taxonomy

Beyond taxonomy

- *Akkermansia muciniphila*   mucin-degrading/mucin-maintenance

- Present in 64% of samples (Abubucker *et al.* PloS ONE 9(5) (2014)

- Important in response to Immune checkpoint inhibitor treatment? (B. Routy et al., Science 359, 91–97 (2018))

- Other known mucin-degrading bacteria*:

  - *B. thetaiotaomicron*

  - *B. fragilis*

  - *B. vulgatus*

  - *B. caccae*

  - *R. gnauvus*

  - *R. torques*

  - *B. bifidium*

  - *B. longum subsp. longum*

  - *B. longum subsp. infantis*

  * Tailford *et al.* Front. Genet. 6:81 (2015)

Applications of PMP

Personalized Nutrition

- Dietary intervention
- Effect of pro- and pre-biotics

Research use

- Larger cohorts
- Longitudinal studies
- New knowledge

Precision Medicine

- Clinical trials
- Patient stratification
- New drugs

Summary Precision Microbiome Profiling - PMP

- Focus on analysis of actual results

- Direct quantification of the important bacteria

- New and important insights to contribution of the microbiome to health and disease

- Readily applicable to be used in Precision Medicine and Companion Diagnostics

- Combined with HUNT4 data – most comprehensive microbiome Database

- Functional characterization of the microbiome

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Bio-Me
Microbiome Profiling