Metabolic and Microbial High-throughput Phenomics in Obese Patients with Different Co-morbidities for Personalizing High-protein Diets

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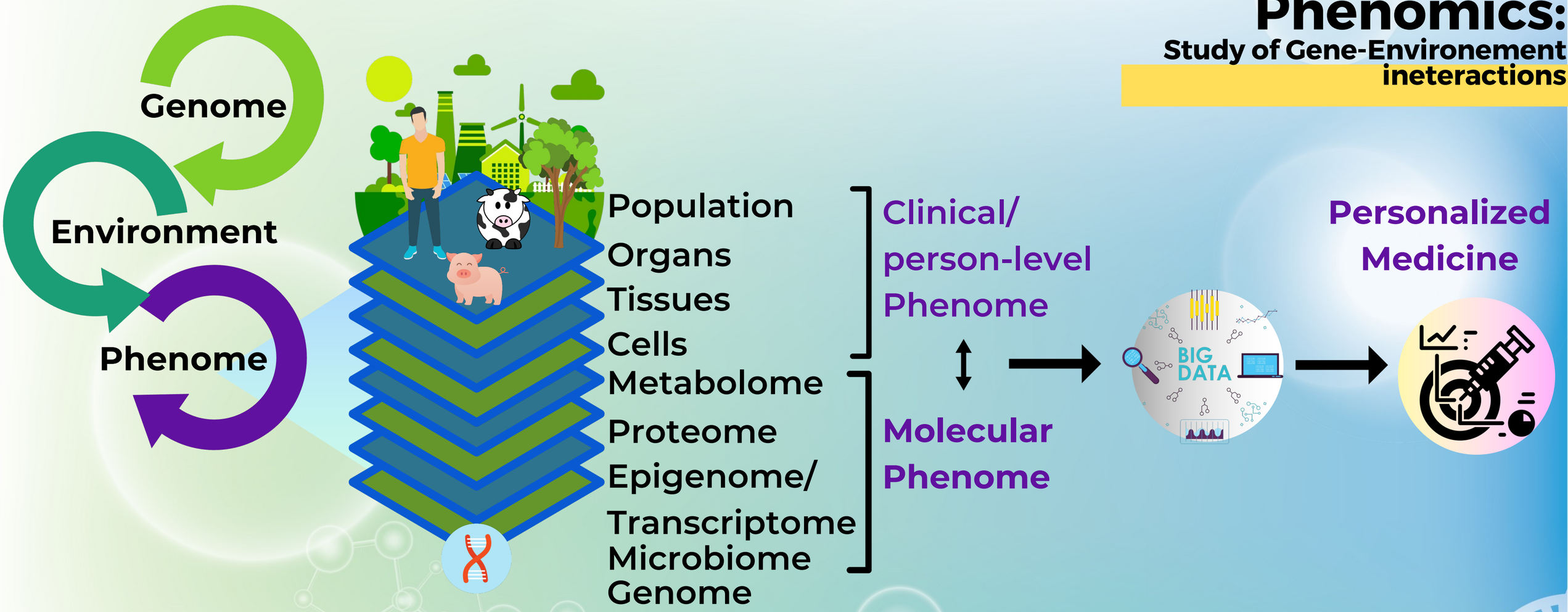
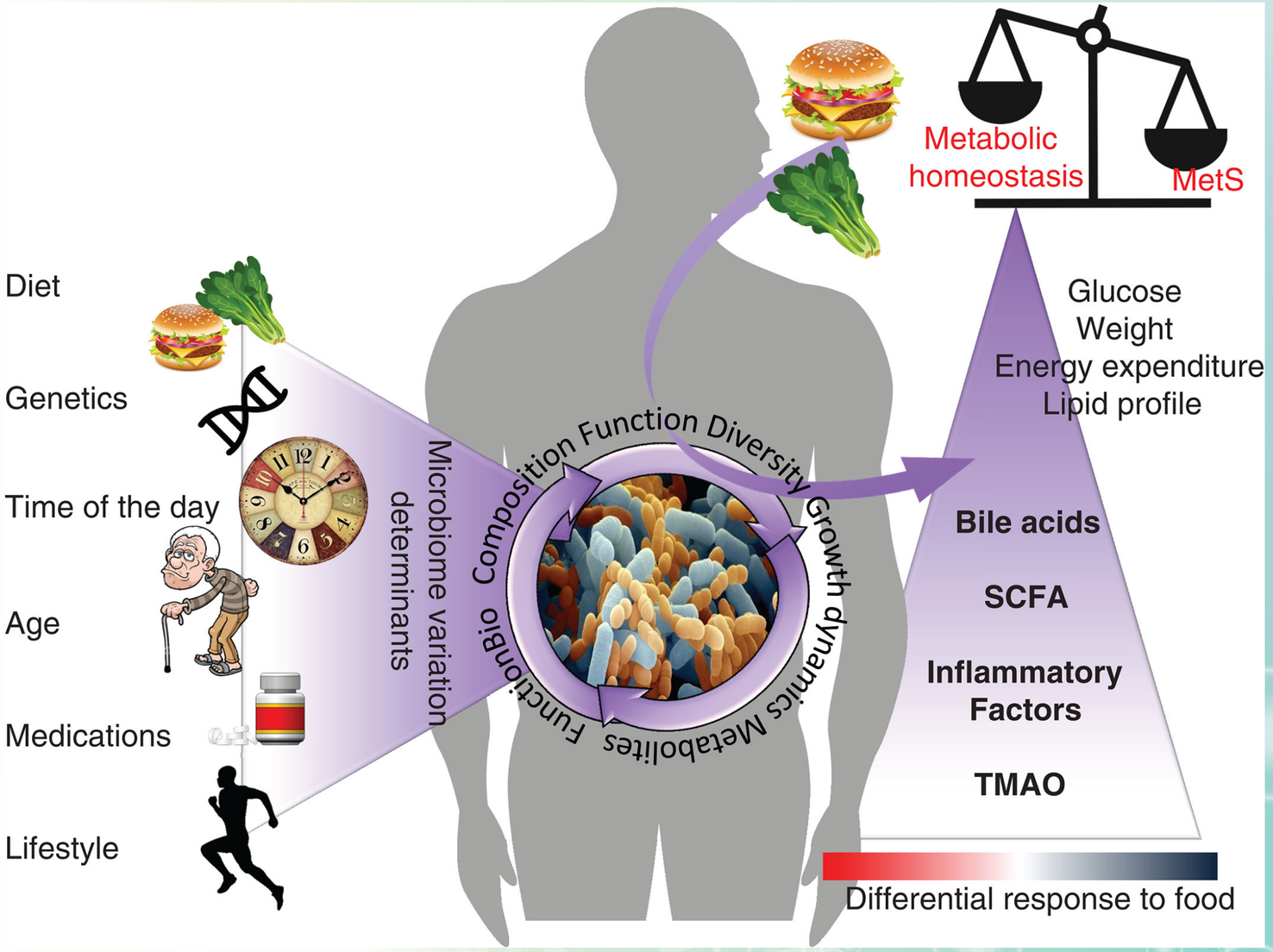
Phenomics:

Study of Gene-Environement ineteractions



A person's phenome is a dynamic fingerprint of their unique biology resulting from the complex interactions between environmental and genetic factors.

Metabolome-microbiome interactions



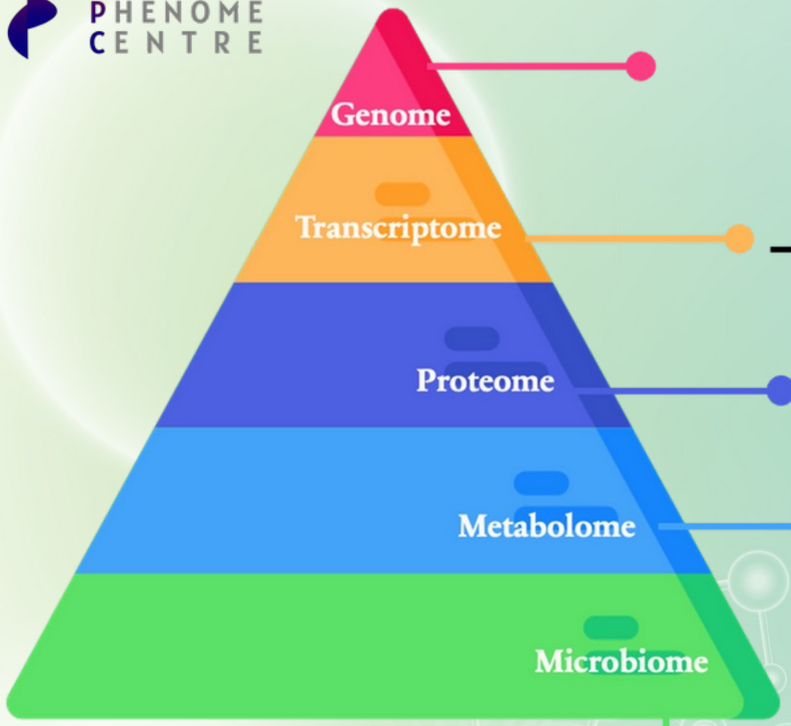
Variations in the microbiome mediate differential effects of the environment on metabolic homeostasis. Multiple host and environmental factors contribute to interindividual variations in the microbiome. This, in turn, leads to a person-specific microbiome regulation of metabolic homeostasis.

Shapiro H et al (2016) Journal of Diabetes.

Technology readiness

KHON KAEN UNIVERSITY PHENOME CENTRE

Phenomics Technology >> Personalized Nutrition



"Phenome"

4 x Oxford nanopore MK1C

1 x Ilumina MiSeq FGx

1 x Easy-nLC-microOTOF-QII

1 x UHPLC-QTOF-MS/MS

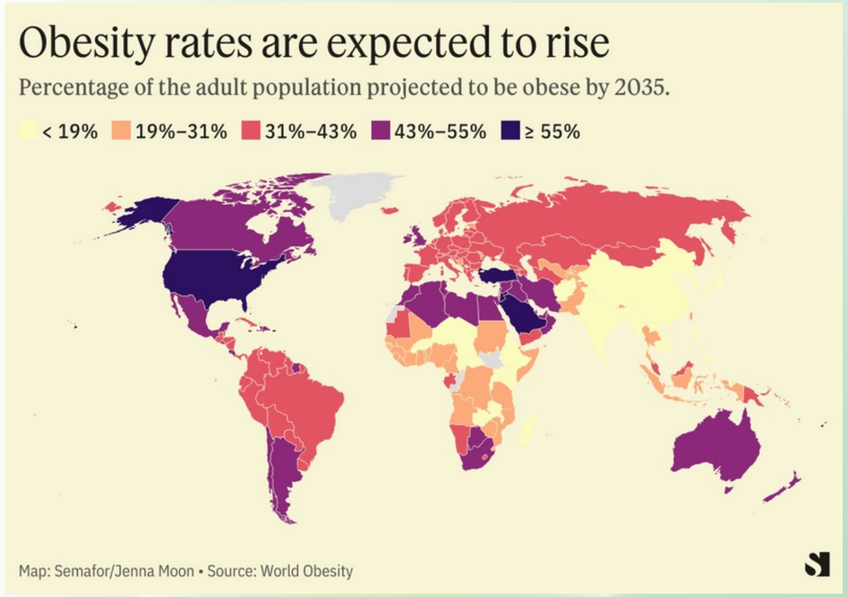
1 x 400 MHz NMR spectrometer

1 x 600 MHz NMR spectrometer

1 x EVOQ-GC-TQ-MS with Robotic Sample Prep Arm

Metabolic and Microbial High-throughput Phenomics (MeMiHiP) in Obese Patients with Different Co-morbidities for Personalizing High-protein Diets

Concept



- Global study predicts that **more than half the global population** will be living with overweight and obesity within 12 years if prevention, treatment and support do not improve.
- The prevalence of obesity (BMI ≥30) alone is anticipated to **rise from 14% to 24% of the population** over the same period, affecting nearly **2 billion** adults, children and adolescents by 2035.
- Obese patients usually have **diverse co-morbidities** and **one-size-fits-all** nutritional program **does not work** for everyone.

Thailand		Australia		Japan		Lao PDR	
ADULTS WITH OBESITY 2035	28% HIGH	ADULTS WITH OBESITY 2035	47% VERY HIGH	ADULTS WITH OBESITY 2035	8% LOW	ADULTS WITH OBESITY 2035	17% MEDIUM
ANNUAL INCREASE IN ADULT OBESITY 2020–2035	5.3% VERY HIGH	ANNUAL INCREASE IN ADULT OBESITY 2020–2035	2.2% HIGH	ANNUAL INCREASE IN ADULT OBESITY 2020–2035	3.6% VERY HIGH	ANNUAL INCREASE IN ADULT OBESITY 2020–2035	6.1% VERY HIGH
ANNUAL INCREASE IN CHILD OBESITY 2020–2035	6.2% VERY HIGH	ANNUAL INCREASE IN CHILD OBESITY 2020–2035	2.6% HIGH	ANNUAL INCREASE IN CHILD OBESITY 2020–2035	2.2% HIGH	ANNUAL INCREASE IN CHILD OBESITY 2020–2035	8.9% VERY HIGH
OVERWEIGHT IMPACT ON NATIONAL GDP 2035	3.5% VERY HIGH	OVERWEIGHT IMPACT ON NATIONAL GDP 2035	2.5% VERY HIGH	OVERWEIGHT IMPACT ON NATIONAL GDP 2035	1.4% HIGH	OVERWEIGHT IMPACT ON NATIONAL GDP 2035	2.6% VERY HIGH

Data Source: World Obesity Atlas 2023

Pain points

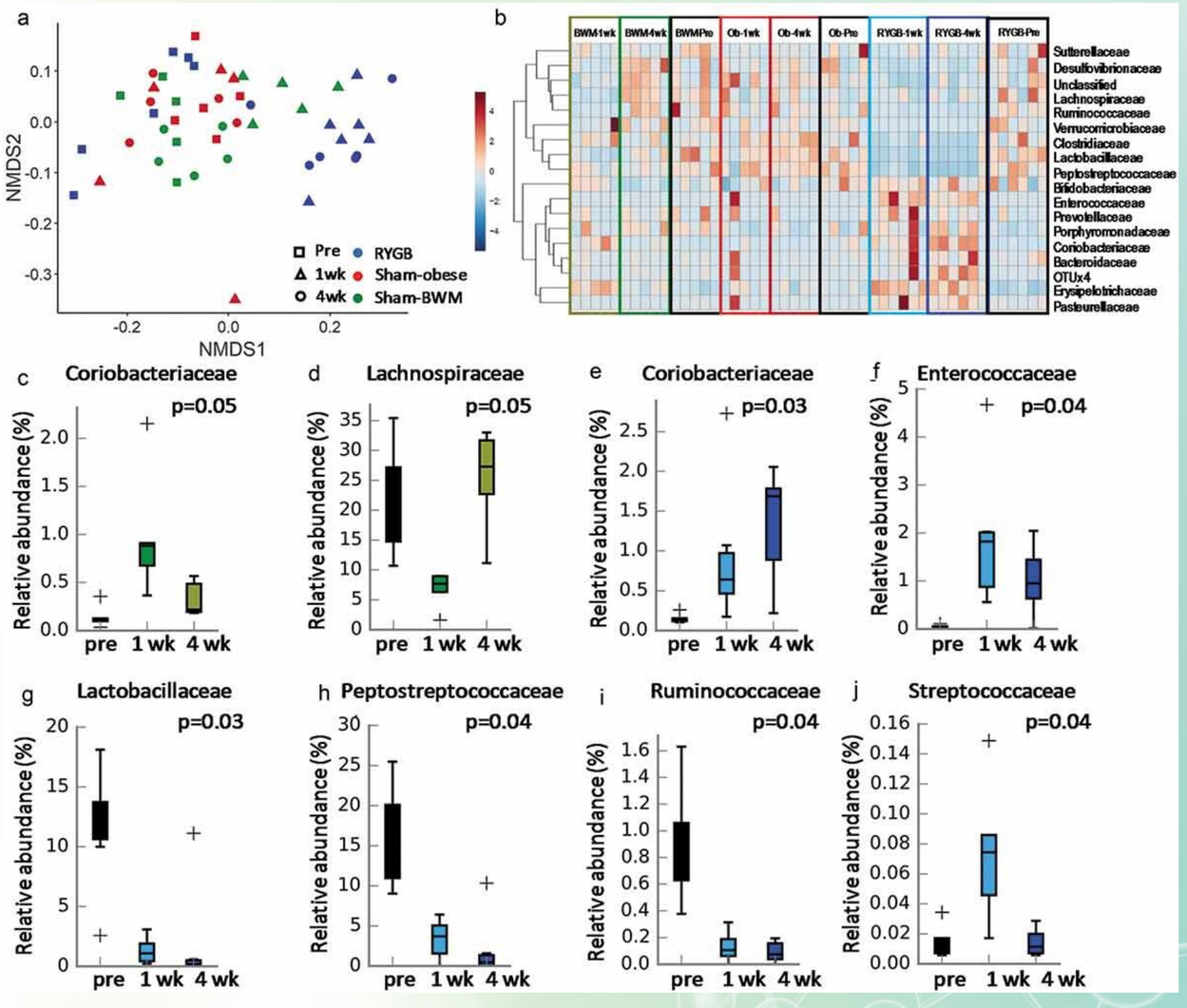
- Insufficientcy of baseline metabolic and microbial information of obese patients with different co-morbidities for patient stratification
- Lack of personalized plant-based high-protein diets for obese patients and following bariatric surgery
- Very few food-form of choice in the high-protein diet market for obese patients

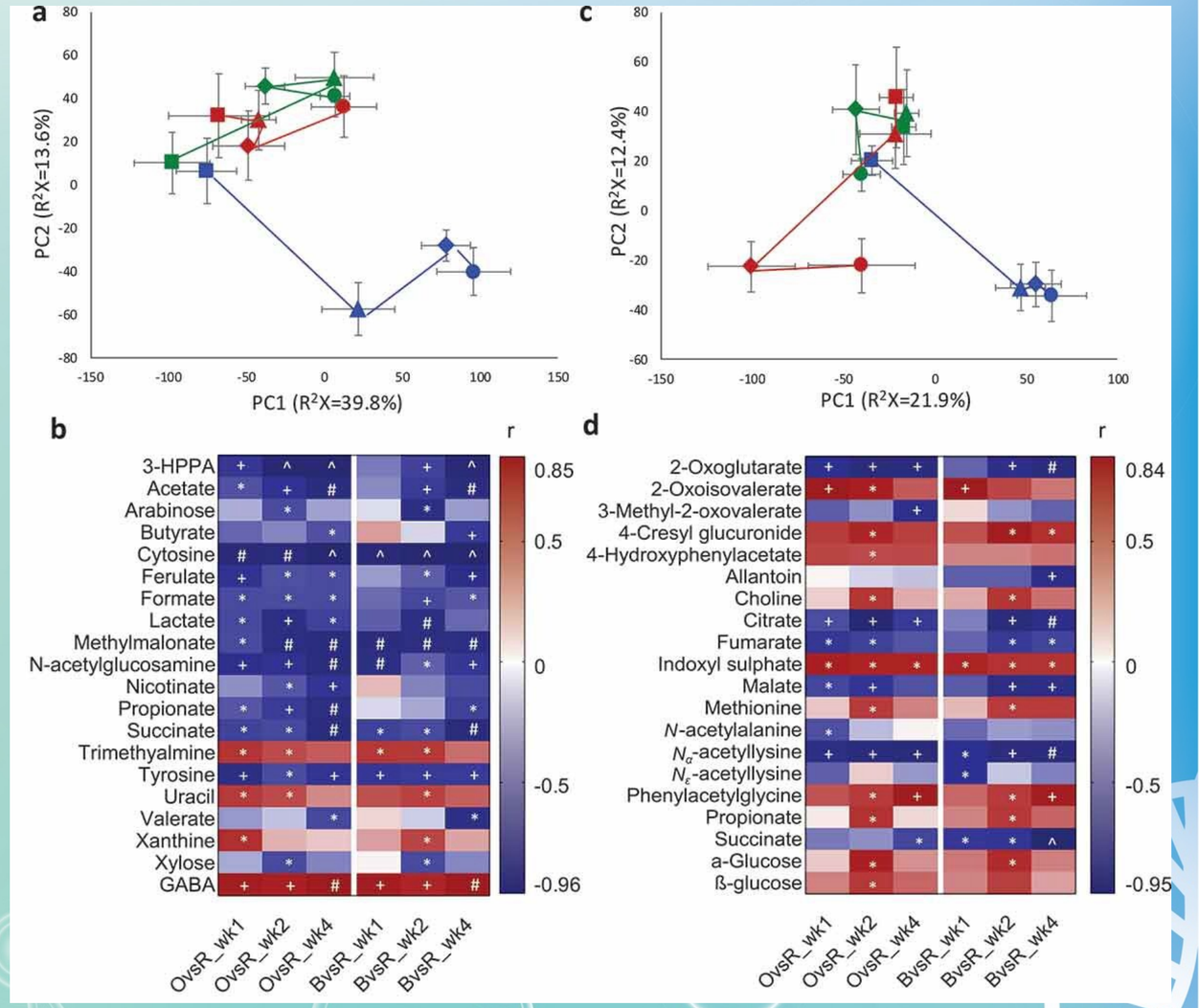
Gain points

- Baseline metabolic and microbial open-database for stratifying obese patients with different co-morbidities
- Personalized plant-based high-protein diets for obese patients with different co-morbidities and following bariatric surgery
- Additional food-forms of high-protein diets for obese patients

Roux-en-Y gastric bypass surgery in Zucker rats induces bacterial and systemic metabolic changes independent of caloric restriction-induced weight loss

Previous Study

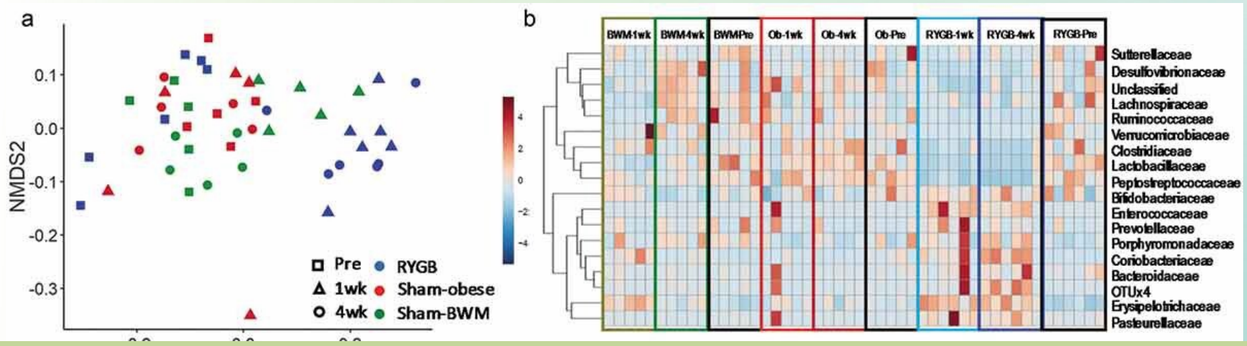


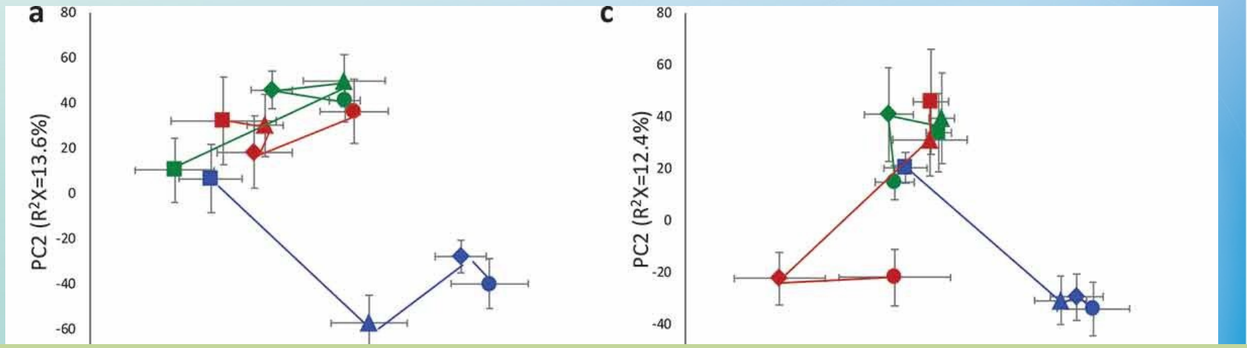


Seyfried F, Phetharaburanin J, Glymenaki M et al (2021) Gut Microbes.

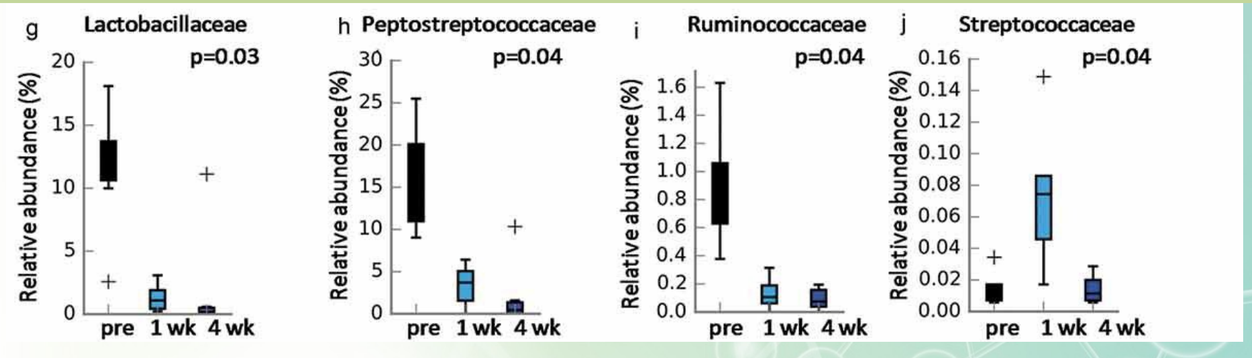
Roux-en-Y gastric bypass surgery in Zucker rats induces bacterial and systemic metabolic changes independent of caloric restriction-induced weight loss

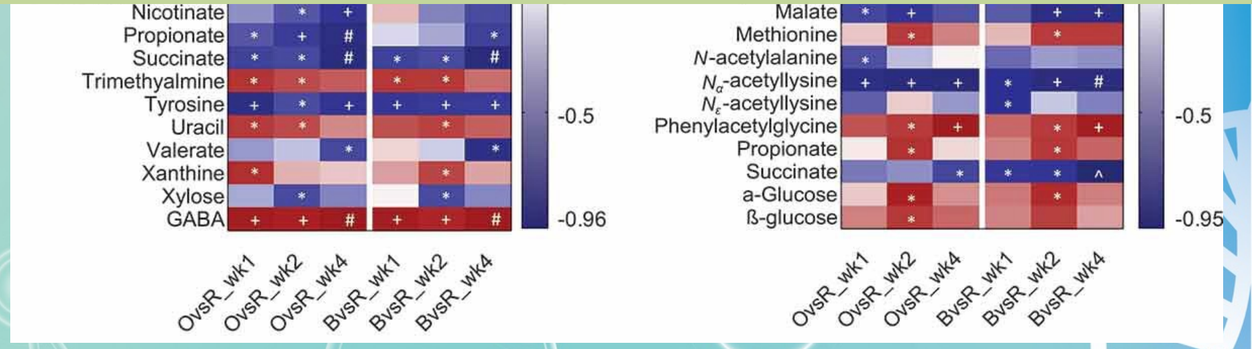
Previous Study





Systemic metabolic profiles of obese Zucker rats collectively demonstrated that RYGB surgery reduced bacterial fermentation activities of fiber, and increased choline and host-microbial co-metabolisms, which are weight loss independent.





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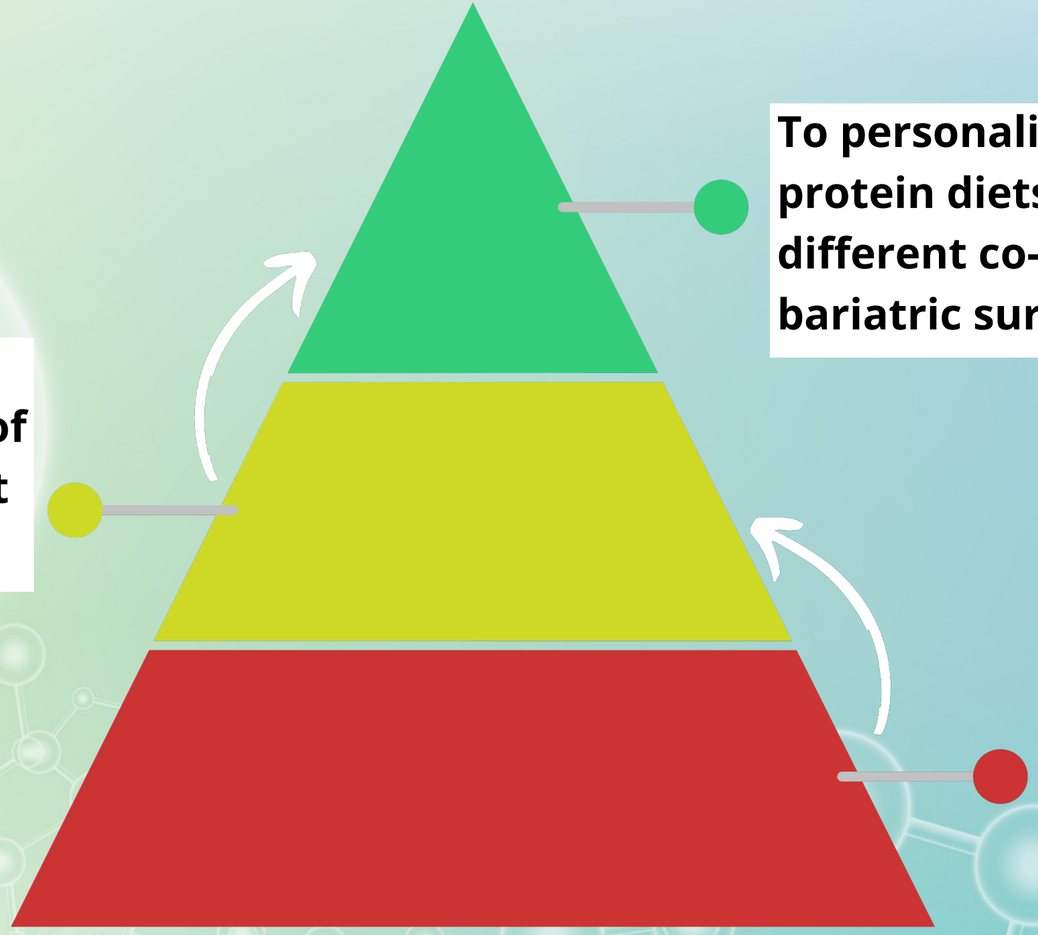
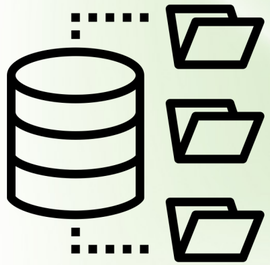
Objectives

To personalize plant-based high-protein diets for obese patients with different co-morbidities and following bariatric surgery



To develop metabolic and microbiome open-database of obese patients with different co-morbidities



To profile baseline metabolic and microbiome information of obese patients with different co-morbidities

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สร้างคน ข้ามพรมแดน

CARI Cholangiocarcinoma Research Institute


Thank You
KHON KAEN UNIVERSITY
PHENOME CENTRE