The future of research in Personalised Nutrition

John Mathers
Human Nutrition Research Centre
Institute of Cellular Medicine
Newcastle University
Human Nutrition Research Centre
UK

food4me.org
Personalised nutrition is becoming big business.
Metabolic challenge test at home

1. TESTING

You collect samples at home and send them to a lab.

Using the at-home kit, you collect your bio samples and send them via a pre-labeled package to Aegis, a CLIA and CAP certified lab. The Habit app makes your test process easy by stepping you through it with instructions and timers.

LEARN MORE

METABOLISM

Your metabolic markers, such as glucose and triglycerides, tell us how your body responds to carbs, fats, and protein after you drink the Habit Challenge® Shake, which is nutritionally similar to a real meal.
Blood Sugar Control Made Easy

The Algorithm Diet personalized to you.

Watch a demo of the DayTwo app

Order now
You receive your personalized nutrition app

DayTwo prepares unique personalized nutrition recommendations for each and every individual.

- Your personalized recommendations can be used for normalizing blood sugar levels throughout the day and night.
- We generate food recommendations specific to your body, like Top Meals for breakfast, lunch and dinner.
The Human Microbiome Project says the human body has 100 trillion microscopic life forms living in it.

Oooh I love carbs

Yuck carbs make me sick

Give us what we want to eat!

You call this living?
A warm welcome to you. And your 39 trillion bacteria.
“Simple” sample collection at home

1. Sample tube
   - This tube contains a special stabilizing fluid that preserves your sample during its journey to our laboratory.

2. Two sterile swabs

3. Replacement sample tube

4. Sample return bag

5. Return mailer

Check Your Eligibility
Your gut microbiome holds insights into your health and wellbeing.
Get the whole picture of your gut microbiome

The Microba *Insight™* report provides personalised dietary suggestions to promote the growth of beneficial gut bacteria. If you have a medical condition or take regular medication, it is important to speak to your medical practitioner before making significant changes to your diet.
Increasing sophistication

FOODPRINT™

The digital signature of how food affects the body.

The Nutrino engine recognizes that not only will two people respond differently to the same food, but a single individual may respond differently to the same food at different times.
Data is only valuable as what you can do with it, and the applications of FoodPrint bring real results that improve lives.

- Chronic Disease Management
- Physician Tools
- Food Trends Identification
- Wellbeing Improvement
- Weight Management
Working with food industry and corporate clients

Deliver a truly personal experience to your customers
Our mission is to transform the world of food. 
Globally.

64% of the world’s population now follows some form of exclusion diet.

We believe finding food to buy, cook and eat should be a joy, not a chore.

We know most people now have a dietary requirement. Sometimes multiple!

We maintain that finding suitable foods shouldn’t be a frustrating experience.

We exist to take the fuss out of finding the right food – whatever the need.
Nestlé and Samsung to collaborate on digital nutrition and health

Jul 28, 2016
Nestle pivots to health research with artificial intelligence and DNA testing for personalised diets

Corporation moves away from sugary products to focus on market for health conscious food

Lisa Du | Corinne Gretler | Maiko Takahashi | 5 days ago | 6 comments

476 shares
Structure of presentation

- What is personalised nutrition?
- What’s the research evidence that it works?

It’s all about you
What is personalised nutrition?

- An approach that uses information on individual characteristics to develop targeted nutritional advice, products, or services.

Ordovas JM et al. (2018) BMJ 361: k2173
The era of personalised (precision) medicine
Personalised nutrition approaches

"One Size Fits all"

I'm Sure He'll Fit...

Personalised approach
Individual variation in weight loss

Gardner CD et al. (2018) JAMA 319, 667-679

609 adults
12 months trial
Rationale for personalised approaches to improving nutrition

Personalised approaches **may** be more effective because:

- Such approaches **are** more relevant (biological basis)
- Such approaches **feel** more relevant (improve motivation...)
Does personalised nutrition work?

John Mathers
Human Nutrition Research Centre
Newcastle University

This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration. (Contract n°265494)
Recruited 1609 adults across 7 EU countries

- Led by John Mathers, Newcastle University

- 7 recruitment sites
  1. University College Dublin (Ireland)
  2. Maastricht University (The Netherlands)
  3. University of Navarra (Spain)
  4. University of Reading (UK)
  5. National Food and Nutrition Institute Warsaw (Poland)
  6. Harokopio University Athens (Athens)
  7. Technische Universitaet Muenchen (Germany)
Participant recruitment

An integrated analysis of opportunities and challenges for personalised nutrition.

Food4Me will consider all aspects of personalised nutrition: from investigating consumer understanding to producing technologies for implementation and investigating gene expression in response to diet.

Read more about the food4me project.
Randomised to 4 treatments

- Level 0: Generic dietary advice (Control)
- Level 1: Personalisation based on **DIETARY** analysis
- Level 2: Personalisation based on **DIETARY + PHENOTYPIC** analysis
- Level 3: Personalisation based on **DIETARY + PHENOTYPIC + GENOMIC** analysis
Generating personalised nutrition advice

Diet
- Omega 3
- Folate
- Vegetables
- Fats

Genes
- FTO
- ApoE
- MTHFR

Phenotype
- Physical Activity
- Weight
- Glucose
- Cholesterol
- Carotenoids
Personalised nutrition improved dietary behaviour

Take home messages

Personalised nutrition works

No added advantage of phenotypic or genetic information

Internet-based delivery is effective

Celis-Morales C et al. (2017) Int. J. Epidemiol. 46, 578-588
Does genetics explain individual variation in weight loss?

609 adults
12 months trial

Gardner CD et al. (2018) JAMA 319, 667-679
Do genetic variants that lead to weight gain make it difficult to lose weight?
Does *FTO* genotype influence weight loss in intervention studies?

FTO genotype and weight loss: systematic review and meta-analysis of 9563 individual participant data from eight randomised controlled trials

Katherine M Livingstone,¹² Carlos Celis-Morales,¹,³ George D Papandonatos,⁴ Bahar Erar,⁴ Jose C Florez,⁵,⁶ Kathleen A Jablonski,⁷ Cristina Razquin,⁸,⁹ Amelia Marti,⁹,¹⁰ Yoriko Heianza,¹¹ Tao Huang,¹¹,¹² Frank M Sacks,¹³ Mathilde Svendstrup,¹⁴,¹⁵ Xuemei Sui,¹⁶ Timothy S Church,¹⁷ Tiina Jääskeläinen,¹⁸,¹⁹ Jaana Lindström,²⁰ Jaakko Tuomilehto,²¹,²² Matti Uusitupa,²³ Tuomo Rankinen,²³ Wim H M Saris,²⁴ Torben Hansen,¹⁴ Oluf Pedersen,¹⁴ Arne Astrup,²⁵ Thorkild I A Sørensen,¹⁴,²⁶ Lu Qi,¹¹,¹³ George A Bray,¹⁷ Miguel A Martinez-Gonzalez,⁹,¹⁰ J Alfredo Martinez,⁹,¹⁰,²⁷ Paul W Franks,¹³,²⁸ Jeanne M McCaffery,²⁹ Jose Lara,¹,³⁰ John C Mathers¹
No effect of *FTO* genotype on BMI response to weight loss intervention

Data were adjusted for age, sex, outcome variable at baseline, ethnicity, country/centre, socioeconomic status, physical activity and smoking

Similar findings for body mass and for waist circumference

Livingstone KM *et al.* (2016) *BMJ* **354**: i4707
Lack of effect of *FTO* genotype on weight loss is robust

**Findings unaffected by:**

**Intervention characteristics**
- Modality (diet or diet + exercise)
- Duration

**Participant characteristics**
- Age
- Sex
- Initial BMI
- Race/ethnicity

Livingstone KM *et al.* (2016) *BMJ* 354: i4707
Behaviour change is key

Exercise is a dirty word. Every time I hear it, I wash my mouth out with chocolate.

Charles M. Schulz
Genetic basis of behaviour change?

Genetic basis for:

- Attention
- Memory
- Reward
- Motivation…
Systems approaches for more effective Personalised Nutrition

Participant characteristics

Barriers & facilitators

Aspirations etc.

Personalised nutrition

Self-monitoring

↑ Health & Wellbeing
Pioneer 100 Wellness Project

“Continuous” real-time data collection

More than 250,000 measurements per day on 43 people for up to 2 years

Li X et al. (2017) *PLoS Biol.* **15**: 2001402
Technology for continuous biomarker measurement

Spray-on nanomesh wearables for health monitoring

Professor Takao Someya
Graduate School of Engineering
University of Tokyo
Wearable technologies, big data and artificial intelligence for more effective personalised nutrition
Challenges

- Potential market for personalised nutrition is huge
- Personalised nutrition is in the market-place **before** we have good evidence of what works (and what doesn’t work)
- Business has developed without regulatory oversight, defined standards and consumer protection
- Most commercial offerings use proprietary algorithms that are not subject to independent verification
- Will personalised nutrition exacerbate, or ameliorate, health disparities?

Ordovas JM et al. (2018) *BMJ* **361**: k2173