CoDiet: You are what you eat

Learn about CoDiet, an international research initiative aimed at addressing diet-related diseases using innovative monitoring technologies and personalised nutrition

It was French lawyer and gastronome Anthelme Brillat-Savarin who famously said in 1826, "Tell me what you eat, and I will tell you what you are". Long before science confirmed it, he discerned what we now know: the food we eat profoundly impacts our health.

CoDiet is a four-year Horizon Europe project uniting 17 partners across ten countries, to better understand the complex relationship between diet and non-communicable diseases (NCDs) such as diabetes and cardiovascular diseases. The project exemplifies multidisciplinary collaboration, bringing together experts in nutrition, engineering and public health, to unlock how what we eat affects how we live.

At the heart of the project is a clinical trial in the UK, Ireland, Greece, and Spain. Four hundred and twenty participants will be provided with a small camera to monitor everything they eat and drink. The recordings are fed into a large language model, which will generate personalised dietary recommendations.

Why personalisation matters

Diet is profoundly personal. Food anchors our culture, memories, and identity; connecting us to family traditions, community, and home. However, even if two people come from the same place and eat the same food, the way each of their bodies react to and process the nutrients, can be vastly different. This variability presents a major challenge: if everyone responds differently to food, how can we provide personalised nutritional advice at scale? CoDiet seeks to explore this question by combining biological insights with behavioural data and advanced AI modelling.

From generic guidelines to personalised approaches

Prof Franco Sassi, Chair in International Health Policy and Economics at Imperial College London explains: "Public health has traditionally relied on dietary guidelines, such as food pyramids and plate models, issued by the World Health Organisation (WHO) and national agencies. These guidelines have undoubtedly improved population health by reducing intakes of added sugars, saturated fats, and sodium while promoting fibre and micronutrients. However, guidelines are general by design. They cannot account for differences in metabolic responses, genetic predispositions, or behavioural contexts. Nor do they fully address the disproportionate burden of diet-related diseases among disadvantaged groups. Policies based on these guidelines, such as food labelling, reformulation incentives, and taxation, remain essential but lack nuance for individual needs. "Personalised approaches are not alternative, but complementary to, generalised dietary guidelines and population-wide policy. The causes

of diet-related ill health are complex, and one-size-fits-all solutions may not be sufficient. Personalisation should be seen as an additional tool in the public health armoury, enabling interventions that reflect individual circumstances and potentially deliver major health benefits."

Precision nutrition vs personalised recommendations

Dr Sara Arranz, PI in the Food and Health Department at AZTI, clarifies an important distinction: "Precision nutrition uses biological data: genetics, metabolomics, microbiome, biomarkers, to design diets optimised for metabolic health and disease management. Personalised recommendations, on the other hand, focus on behavioural and contextual factors, tailoring advice to preferences, lifestyle, and socioeconomic context, often delivered via apps and digital tools to support sustainable change."

The future of nutrition lies in combining both approaches: leveraging omics-driven insights for maximum impact in high-risk individuals, with behavioural adaptation for meaningful, scalable impact.

Policy gaps and challenges

Despite advances in biomarker science, nutrition policies rarely incentivise the use of these tools in clinical practice. Traditional dietary assessment methods, such as food frequency questionnaires and diaries, are prone to misreporting and fail to capture real-world behaviours. Biomarkers offer objective insights but face barriers, including high costs, invasiveness, and lack of reimbursement. Several studies have attempted to bridge these gaps by combining omics data with behavioural strategies for personalised interventions. Zeevi's study (1) revealed large individual differences in post-meal glucose responses and used clinical, lifestyle, and microbiome data to predict them, enabling personalised diets that improved glucose control and gut microbiota. Stance4Health linked microbiome analysis to recipe recommendations and behavioural coaching via mobile applications, enhancing adherence across diverse populations. (2) However, these innovations still outpace the evidence and frameworks needed to support them. Long-term health impacts remain modest, while cost and complexity limit scalability. Digital and AI-driven tools could help scale personalised nutrition through predictive modelling and real-time feedback, but their success depends on user trust and usability. Policies must therefore support both technological innovation and behavioural research to ensure equitable, effective personalisation. A harmonised, integrated approach is essential to protect consumers while enabling innovation.

Integrating biomarker-based data to model diet–disease pathways

Accurate dietary assessment is fundamental for understanding and predicting NCD risk. Traditional self-report tools and biomarkers, such as glucose and lipids, explain only part of the variability in how diet influences health. They cannot fully capture the complex biological processes that link diet to disease outcomes, nor account for individual differences in responding to the same foods. CoDiet addresses these gaps by integrating a wide spectrum of multiomic biomarkers to create a clearer picture of how diet affects the body.

This approach clarifies how dietary patterns affect the body, revealing the biological pathways that connect food choices to disease risk. When combined with AI and Machine Learning techniques, these biomarkers allow CoDiet to map causal pathways, improve risk prediction, and generate personalised health trajectories, supporting both individualised advice and population-level screening.

Real-time monitoring and scalability

To deliver personalised nutrition at scale, non-invasive, continuous monitoring is key. CoDiet assesses technologies such as wearable passive cameras to capture eating episodes and estimate portion sizes using Deep Learning, urinary and capillary fingerprick blood metabolomics for objective assessment of dietary intake, smart sensors for vascular health indicators like arterial stiffness and advanced glycation end-products (AGEs), and activity trackers to contextualise energy expenditure. These tools reduce participant burden, improve data richness, and strengthen the connection between dietary behaviours and health outcomes. By combining monitoring tools with AI systems, CoDiet is advancing a scalable, equitable approach to personalised nutrition, which can be embedded into public health frameworks and applied across diverse populations.

Looking ahead

The promise of personalised nutrition is clear: improved understanding of food intake, improved health outcomes, reduced NCD burden, and more effective public health strategies. Yet, realising this vision requires strong evidence, clear ethical safeguards, supportive policy, skilled practitioners, and scalable technologies that integrate biological and behavioural insights.

CoDiet is helping to drive this shift, demonstrating how multidisciplinary collaboration and innovation can reshape the future of nutrition. By moving beyond static guidelines toward personalised solutions, we can better address the complexity of diet-related health challenges and live up to Brillat-Savarin's timeless observation that our health is shaped by what we eat, and understanding this connection is key to a healthier society.

References

1. Zeevi D, et al. Cell. 2015 Nov 19;163(5):1079-1094. doi: 10.1016/j.cell.2015.11.001. PMID: 26590418.
2. Dello Russo M, et al. The Stance4Health Project: Evaluating a Smart Personalised Nutrition Service for Gut Microbiota Modulation in Normal- and Overweight Adults and Children with Obesity, Gluten-Related Disorders or Allergy/Intolerance to Cow's Milk. Foods. 2022 May 19;11(10):1480. doi: 10.3390/foods11101480. PMID: 35627049; PMCID: PMC9141043.

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