NUTRITIONAL PLATFORMS

# Plant-Based Potential: Nutrition Powerhouses

## Developing knowledge in the field of inter-individual variation in response to plant food bioactives will broaden perspectives for the European industry to design customized foods that can be used in personalized nutrition.

by Baukje de Roos, Christine Morand & Mayte García Conesa

Healthy diet and lifestyle choices are the primary tools for the prevention of cardiometabolic diseases, including cardiovascular disorders and type-2 diabetes, as well as associated risk factors, such as metabolic syndrome and obesity. Decades of research focusing on the development of high quality and healthy foods have contributed to a decrease in the burden of diet related chronic diseases and to a general improvement of the population's health. In addition, it has promoted the sustainable economic growth of the food and drink sector. Despite this, the challenge of stimulating consumers to select foods that fit into a healthy diet and to stimulate the agro-food sector to develop healthier foods.

### One Size Does Not Fit All

Dietary patterns containing high levels of plant-based foods have repeatedly been shown to be beneficial for human health.

Therefore, dietary advice to increase the consumption of fruits, vegetables, wholegrains and derived products is one of the most widely accepted and well-known public health policies across the globe.

However, thus far, recommendations for fruits and vegetables are promoted to the general population in a "one-size-fits-all approach," which does not necessarily ensure that everyone is adequately exposed to the protective constituents provided by these foods.

Extensive research has been carried out to identify the plant food components that induce the biological activity responsible for the health effects of plant-based foods.

These foods are exclusive and rich sources of a wide variety of phytochemicals, including polyphenols, carotenoids, plant sterols and glucosinolates which are all known to exert a wide range of biological effects.

Although not strictly considered as essential micronutrients, some of these dietary bioactive compounds have been described as "lifespan essentials," since they help to maintain optimal health and fight the deleterious effects associated with aging.

Plant food bioactives are widely distributed in the diet, but specific groups of compounds can be particularly abundant in some foods. For these foods, specific dietary recommendations could be developed e.g. glucosinolates in cruciferous vegetables, isoflavones in soy, anthocyanins in berries, or lycopene in tomatoes.

There is increasing evidence from cohort and clinical studies that many of these phytochemicals may help to reduce the risk of cardiometabolic diseases.

Furthermore, specific physiological effects with implications for cardiometabolic health have been attributed to different bioactive compounds, such as the improvement of endothelial function, platelet function, insulin sensitivity, blood lipids and blood pressure.

These effects may be related to the antioxidant, anti-inflammatory and anti-atherogenic activities, that have been evidenced through a wide panel of mechanistic studies. More recently, these compounds have been proven to have modulatory properties of the gut microbiota composition, with relevant repercussions on metabolic health.

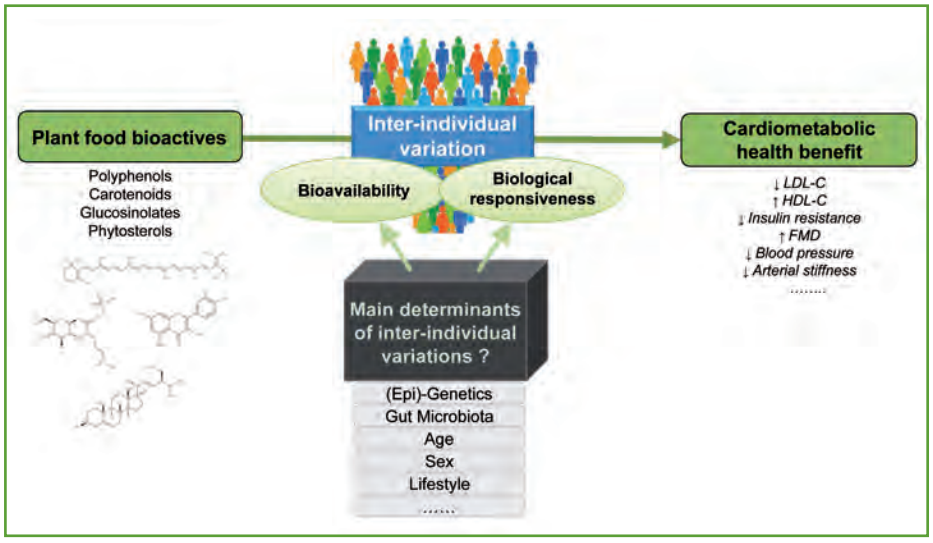


**Figure 1: Potential factors responsible for the inter-interidividual variation in bioavailability and biological responsiveness to the consumption of plant food bioactives**

### Inter-Individual Variation

Results from human intervention trials show large differences between individuals in the absorption, distribution, metabolism and excretion of plant food bioactive compounds, as well as a considerable heterogeneity in their biological response, regarding cardiometabolic health outcomes.

This inter-individual variation in the efficacy of the bioactive compounds to prevent cardiometabolic diseases implies that the consumption of specific plant-

based foods or ingredients will benefit some more than others.

Knowing which "human" factors determine individual responsiveness to plant-based foods, which may include age, sex, genetic background and gut microbiota, is essential to establishing which groups of consumers are likely to benefit, in terms of health, from the consumption of specific groups of foods or ingredients (figure 1). However, knowledge in this domain is, at present, very limited, highly fragmented and thus, many research gaps remain to be filled.

Improving our knowledge of the factors that influence whether bioactives are more or less effective in individuals is required. Together with this is the development of new and innovative methodologies to stratify the populations into subgroups according to their ability to respond to plant food bioactives consumption. This will be invaluable to progress in the development of effective and innovative dietary solutions leading to health improvements (Manach et al, MNFR, 2016).

## The Rise in Knowledge

Developing knowledge in the field of inter-individual variation in response to plant food bioactives, will open perspectives for the European industry to design customized foods with effectiveness that are adapted to different categories of populations and that can be used in personalized nutrition.

Indeed, this will offer significant opportunities for the food and drink industry to develop new functional foods or optimized traditional foods with more pronounced health benefits for targeted consumer groups. For example, adapting processing methods may improve the bioavailability of key bioactive compounds for individuals identified as poor absorbers/metabolizers.

Continued research in this area will also provide new scientific evidence to develop a new generation of "individualized" nutritional recommendations that will help to improve the prevention of cardiometabolic diseases in the general population in the long run.

In particular, it may lead to refined recommendations towards foods particularly rich in specific bioactives, and to public health advice targeting specific populations.

This is of utmost importance considering that globally, the intake of fruits and vegetables does not meet recommendations, with less than 25% of the population consuming at least five portions per day (400g) in most countries. Therefore, more personalized messages for this healthy food group could be highly beneficial to both individual as well as population health.

## Optimizing Health Effects

The successful tackling of inter-individual variation in response to plant food bioactives undeniably constitutes a key aim to optimize the health promoting effects associated with dietary plant food bioactives.

Currently, the European initiative COST-FA1403 POSITIVe (2014-2018) develops networking activities addressing, through a multi-dimensional approach, the complexity of the inter-individual variation in response to plant food bioactives consumption (figure 2).

This multi-disciplinary and cross-sectorial European network gathers top-level scientists [nutritionists, clinicians, geneticists, epidemiologists, microbiologists, experts in gut microbiome and nutrigenomics, bioinformaticians, molecular biologists and food scientists from more than 70 research institutions in 32 countries], members of regulatory authorities and representatives of the food industry.

This network analyzes available data from the literature to identify the "human" factors that underlie the inter-individ-

Table 1: Beneficial Effects of the Consumption of Flavonols or Flavonols Containing Foods on Cardiometabolic Biomarkers

| Cardiometabolic Biomarkers | Effect | N Studies* | P-Value** |
|---|---|---|---|
| Total Cholesterol | Lowering | 18 | <0.05 |
| LDL | Lowering | 18 | <0.001 |
| HDL | Increasing | 18 | <0.001 |
| TAGs | Lowering | 17 | <0.01 |
| Glucose | Lowering | 15 | <0.01 |
| Blood Pressure | Lowering | 12 | <0.001 |

*Number of human clinical studies included in the analysis
***P*-value <0.05 or 0.01 (significant evidence), <0.001 (very significant evidence)

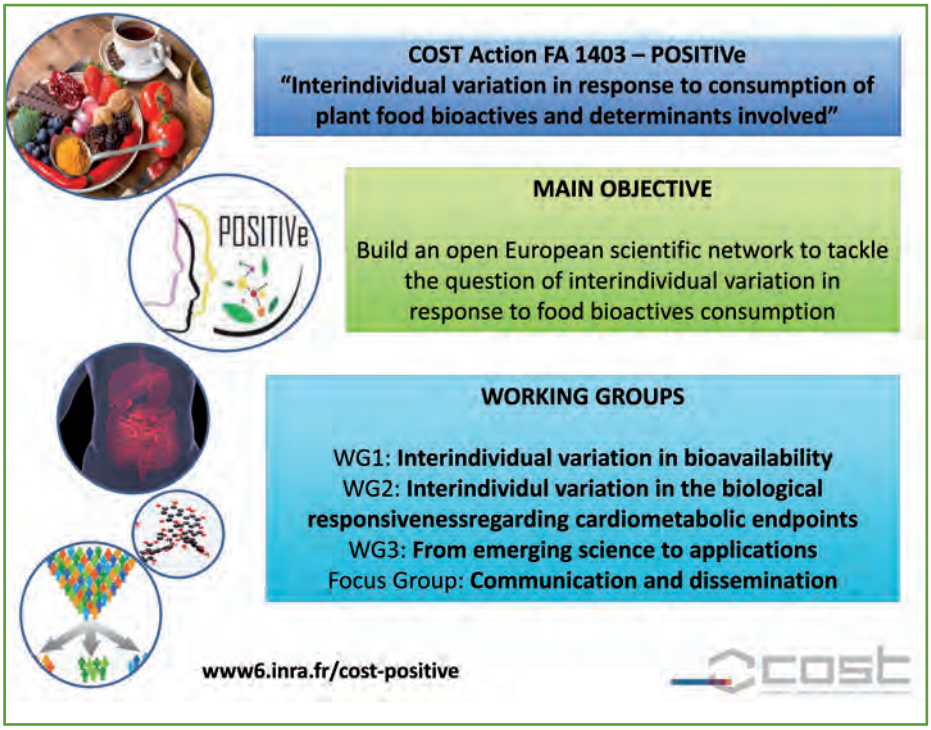


**Figure 2: COST-POSITIVe network: aims and organization**

ual differences in efficacy. In a very recent publication, several partners of POSITIVe (Menezes et al., 2017) gathered and critically examined the most up-to-date evidence for the effects of flavonols, a group of bioactive compounds abundant in onions, spinach, asparagus, and some berries, on various cardiometabolic biomarkers in humans.

The results of this analysis indicate that the consumption of these compounds significantly reduces fasting glucose, blood pressure, total cholesterol, LDL cholesterol & triglycerides, and significantly increases HDL cholesterol (table 1). Interestingly, these beneficial effects were more pronounced in Asian populations and in those already diagnosed with disease or dyslipidaemia, compared to healthy people.

These results show the relevance of investigating and establishing all the potential factors that may modulate human responses to the intake of these and many other bioactive compounds. At present, the COST POSITIVe network is performing similar analyses for other groups of bioactive compounds. The results and conclusions of this joint effort will provide new and valuable information to develop innovative strategies that can help the food and drink industry to exploit individual variability, ultimately improving customer's health. The ultimate goal would be to ensure that the cardiometabolic health-promoting effects associated with bioactives present in plant foods are applicable for everyone.▼

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## › DuPont Develops Probiotic Solution for Weight Management

**DuPont Nutrition & Health has launched HOWARU Shape, an innovative probiotic formula clinically proven to reduce waist circumference in overweight adults. In a clinical study, Howaru Shape, which contains 10 billion CFU Bifidobacterium lactis B420, reduced waist circumference by up to one inch.**

**When taken in combination with 12g Litesse Ultra prebiotic fiber, Howaru Shape also was shown to reduce body fat mass and trunk fat.**

**The study was conducted with 225 healthy volunteers (healthy, BMI 28–34.9) who were randomized into four groups (1:1:1:1), using a computer-generated sequence, for 6 months of double-blind, parallel treatment.**

**"Howaru Shape was officially introduced globally for commercialization at this year's Vitafoods show in Geneva and has now been introduced into the US market where sales – among others through healthcare professionals – are showing very promising results," Ole Danielson, Global Marketing Manager, DS, DuPont Nutrition & Health notes.**

**"In the US, structure/function claims enables the product to be clearly positioned into the burgeoning weight management market.**

**"In other markets such as within EU claim possibilities are restricted making it highly relevant to educate medical professionals and key opinion leaders on the strong science supporting Howaru Shape to secure medical endorsement and recommendation towards consumers," Danielson explains.▼**