

Smart Technologies for Personalized Nutrition and Consumer Engagement (Stance4health Eu H2020 - Funded Project)

Alexandru Vasile RUSU^{1*}, Berta ALVAREZ PENEDO¹, Malte BETHKE², Ann-Kristin SCHWARZE¹, Monica TRIF^{2*}

¹Biozoon Food Innovations GmbH, Fischkai 1, 27572 Bremerhaven, Germany

²Centiv GmbH, Food Research Department, Villingener Weg 10, 28816, Stuhr, Germany

*corresponding author: rusu@biozoon.de, mt@centiv.de

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Abstract

The overall objective of Stance4Health EU H2020 project is to develop Stance4Health will develop a complete Smart Personalised Nutrition (SPN) service in an interdisciplinary approach through the exchange of knowledge and methods of different disciplines (i.e. nutrition food sciences, nutrition-health sciences, consumer science-social anthropology-psychology, economics and computer sciences, among others) via shared knowledge-interactions. Based on the use of mobile technologies as well as tailored food production that will optimize the gut microbiota activity and long-term consumer engagement. Stance4Health will also increase the health status and well-being of individuals by adopting a longlasting healthy and sustainable dietary behaviour. A huge innovation capacity will be enhanced by creating new market opportunities and bringing other important benefits to the European society from the Circular Economy and the Digitising European Industry Focus Areas.

Keywords: nutrition, personalised, gut microbiota, dietary supplement, nutraceutical

Introduction

Stance4Health EU project addresses topic DT-SFS-14-2018: Personalised Nutrition, belonging to the Work Programme 2018-2020 of "Food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy" (CORDIS, EC). The specific challenge of this topic is to tackle some of society's grand challenges like the development of new, secure and healthier foods while fighting against 21st century NCDs. The world is currently facing

a Nutritional Transition, which has been onset by an obesogenic food environment resulting from a global adoption of the Western diet. NCDs such as type 2 diabetes, metabolic syndrome, and obesity are responsible for almost 70% of all deaths worldwide (WHO in „Global Action Plan for the Prevention and Control of Noncommunicable Diseases (NCDs) 2013-2020“).

To reach all of the impacts stated in the call topic, the project consortium comprises 19 partners from 8 European countries. The

project SME' partners are in charge to develop and further commercialize the followings: a novel SPN service, which include new apps for personalised nutrition, and integration of a wearable device for daily analysis of one's body composition; individualised dietary supplements and nutraceutical, and tailored cereal-derived foods for specific consumer groups (coeliac disease or food allergy, overweight); and an *in vitro* diagnostic test to control the gut microbiota activity (Stance4Health EU Project). These novel tools and services have the potential to directly impact more than 67 million European adults and 8 million children by 2022.

The prebiotic foods (including cereal-based) and dietary supplements market (such as tannins or individualized specialty dietary supplements developed along Stance4Health) is expected to reach to reach USD 7.11 billion by 2024 (GrandViewResearch, 2016), as more complex prebiotic protective systems have to be developed (Pop *et al.*, 2015; Vodnar and Socaciu, 2012), and Europe will be the largest world market accounting for over 39% of market volume. The impact of these novel food products will be quantified by means of the number of new foods prepared with new prebiotics, the economic profit derived from such products, the number of new SMEs specialized in the targeted development of prebiotics.

The overall objective is to select and maintain of a better personalised nutrition based on the use of smart mobile technologies and tailored food production (personalised foods enriched in tannins and/or riboflavin and the nutraceutical AlcaLip), which will have an impact on the gut microbiota activity optimization (Fuertes *et al.*, 2019; Zanoaga *et al.*, 2019).

As many of the technologies and products used in Stance4Health already exist (commercial i-Diet version for health professionals, InBody BAND 2 for individual monitoring of physical activity, personalized products, *in vitro* metabolomics diagnostics for gut inflammation, dysbiosis, autism or behavioural disorders), the main focus of Stance4Health objectives will be on technological innovation and advances to merge these technologies and redesign them into a comprehensive platform for personalised nutrition, in order to yield a technology readiness level (TRL) of 5-7. Much of the information to be implemented in the i-Diet software will be

collected from the scientific literature (nutritional composition of foods, gut microbiota composition of population subgroups, etc.) while other research activities will be performed in order to build a mathematical algorithm for i-Diet (in order to offer nutritional counselling depending on the individual gut microbiota composition, part of objective 1) and to unravel how consumer beliefs and preferences can be incorporated into the implementation of personalised diets leading to a more sustainable adoption of healthy diets in the long-term.

Besides, the research will be focus as well on the development of approaches for customizing individualized dietary advice for specific population subgroups (i.e. children Vs. adults), and of development of suitable and attractive products to support individualized, healthy diets (group-tailored cereal-derived foods, nutraceuticals, individualized specialty dietary supplements, etc.).

Materials and methods

Stance4Health will set out to accomplish the targeted specific objectives as followings:

1. Definition of a high-quality metabolic network of the human gut microbiota and insights into how the network is affected by foods and culinary practices;
2. Development of food databases to be implemented the mobile app;
3. Development of a dietetic software for consumers;
4. Design of customized foods for specific (vulnerable) target groups (celiac disease, food allergies, overweight);
5. Citizen engagement with personalised nutrition;
6. Validation of the smart personalised nutrition strategies in adult and children populations, in a near to operational environment.

Results and discussions

Dietary supplements (including vitamins, minerals or plant extracts with dietary fibres and polyphenols) will be developed by project partners Biozoon and CENTIV for the specific population groups (e.g athletes, malnourished people) which require high nutrient supplementation.

The personalised food supplements enriched with special tannins extracted from different sources (i.e. chestnut, quebracho, etc.) (Molino *et al.*,

2020; Dietrich et al., 2016), will be produced in form of a powder, ready to be mixed in drinks in an individualised manner, being the entry step in the European Food Sector for personalised nutrition (Trif et al., 2016a).

The tannins will be extracted by means of water, ethanol or water-ethanol mixtures at different ratios. Powder formulations comprising different nutrients and extracted tannins in different combinations will be implemented and will be exactly adapted to the individual needs (Forstner and Rusu, 2015). Tannins have an astringency and bitter flavor, and therefore will be define how the bitterness can be modify by coating the bitter-tasting tannins extracted using gum-like or carbohydrate-based algae combination formulas to form double-phase emulsion micro-encapsulation (Trif et al., 2016b; Petrut et al., 2016) or using the spray-dry method to obtain particles with tannins.

Beside the personalised food diet, when calculating the individual food supplements, aspects such as body weight, physical activity, training duration, specific medical recommendation (e.g in case of malnutrition) (Bethke et al., 2016; Rusu et al., 2020) as well as gut microbiota metabolism will be considered (Agans et al., 2018). The best products designed will be tested in a short human intervention (Pérez-Burillo et al., 2020).

It is well-known tannins antioxidant, antimicrobial (increase the shelf-life of foods) and antibacterial (inhibitor to foodborne bacteria) effects, and therefore their application as food enhancements and food preservatives it is of high importance due to their protective nature as well, besides the healthy effects (Braicu et al., 2017).

Conclusions

The specific personalised nutrition tools developed along Stance4Health project will be based on robust scientific evidence and knowledge from different fields like nutrition, medicine, food sciences, microbiology, computer sciences, and social sciences and humanities like economics, marketing, psychology and social anthropology. The foods and specialty dietary supplements application is increasing consumption due to rising health consciousness among consumers and due to the growing attention given of prebiotics in weight management nowadays.

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