



The Horizon 2020 PROMISS project “PREvention Of Malnutrition In Senior Subjects in the EU”

Over 20 million older citizens are at risk of protein malnutrition in Europe, whose consequences on health are serious and often irreversible.

The Horizon2020 PROMISS project (<http://www.promiss-vu.eu/>) tackles malnutrition with a specific focus on **protein-energy malnutrition**. PROMISS makes use of large-scale databases to understand the relationships between food intake, food characteristics, physical activity, the oral and gut microbiota, and poor appetite, malnutrition and poor health among older adults. Preferences and attitudes of older persons about food intake and physical activity are also taken into account.



Based on the outcomes of this research, **PROMISS will develop optimized, sustainable and evidence-based dietary and physical activity strategies**, which are currently tested in the Netherlands and Finland for effectiveness and cost-effectiveness in a long-term intervention study.

The project will show whether these strategies together with new food concepts and products will prevent malnutrition and support active and healthy ageing.

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A sneak peek of PROMISS research

PROMISS research brings findings relevant for the battle against malnutrition and that highlight the importance of increasing protein intake when growing older. Here is an overview of the most promising outcomes of PROMISS to date.

Protein intake and its sources

- Older adults with a poor appetite consumed less protein and dietary fibre, less solid foods, smaller portion sizes, less wholegrains, and less fruits and vegetables than older adults with a very good appetite. They also consumed more dairy foods, fats, oils, sweets and sodas. (van der Meij et al. 2017)
- Of those aged 85 years and older, 28% consumed less than the recommended protein intake target (0.8 g of protein per kg of adjusted body weight per day). This group ate less meat, more cereals and drank more non-alcoholic beverages than those who had an adequate protein intake. (Mendonça et al. 2018)

Protein intake and physical activity

- Lower protein intake may negatively affect muscle strength and physical performance in late life, and a combination of adequate protein intake and physical activity may be necessary to reduce the loss of muscle strength in the very old. (Granic et al. 2017)
- Dutch older adults spend on average 65% of their waking time sedentary. Older adults' sedentary times differ by age, sex, education and body mass index (BMI). The combination of high sedentary time and low physical exercise was associated with higher age, higher BMI, and slower walking speed compared to the combination of low sedentary time and high moderate to physical activity (van Ballegooijen et al., 2019)

Protein intake and other associations

- Higher protein intake, in particular 1.0 g/kg of adjusted body weight/day or more, was associated with better disability trajectories in the oldest adults. These findings will inform new dietary strategies to support active and healthy ageing. (Mendonca et al. 2018)
- At all eating occasions, Dutch community-dwelling older adults with a protein intake <0.8 g/kg of adjusted body weight/day ate less protein (and relative to their energy intake) and a lower proportion of animal protein, compared to those with a high protein intake. These differences were greatest at lunch. Major food sources of protein in both groups were dairy, meat and cereals. Following a diet, being obese and not drinking alcohol were identified as general characteristics of older adults with a lower protein intake. (Hengeveld et al 2019)
- A dietary pattern high in foods characteristic of a traditional British diet (butter, red meat, gravy and potato) was associated with an increased risk of sarcopenia even when overall protein intake was good. (Granic et al. 2019)

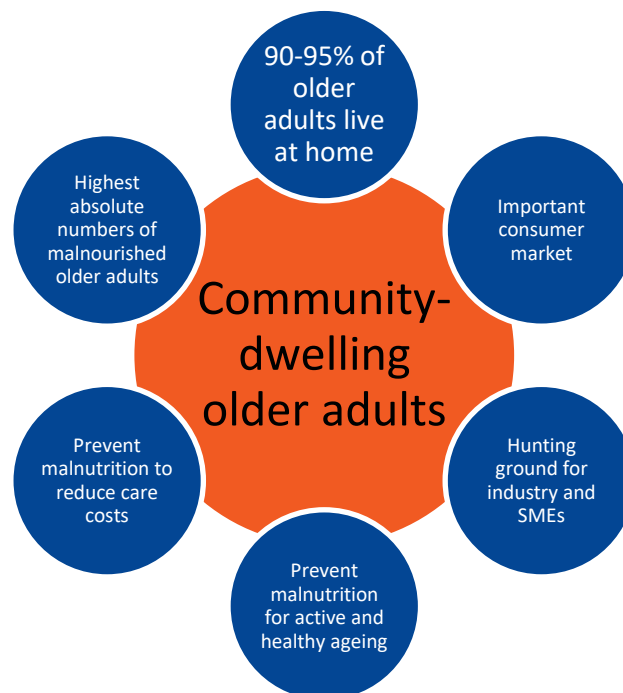


- The Pro⁵⁵⁺ Protein Screener was developed and can be used to validly screen for protein intake below 1.0 gram/kg body weight of protein per day in community-dwelling older adults. It is recommended that the screener should be validated in other countries. An online version can be found at www.proteinscreener.nl. (Wijnhoven et al. 2018)
- Higher protein intake may lower the risk of developing chronic protein-energy malnutrition in community-dwelling (i.e. living at home) older adults. (Hengeveld et al. 2018)
- Older adults with a lower protein intake seem to be at greater risk of developing mobility limitations over 6 years. (Houston et al. 2017)

Malnutrition and the intestinal microbiota

- This microbiota has been demonstrated to actively influence human energy balance. Thus, a disruption of the normal microbiota can contribute to the development of malnutrition.
- It was demonstrated that microbial composition differs between subjects with and without malnutrition.
- Literature review summarizes the pathways through which the intestinal microbiota might contribute to malnutrition, how the microbiota differs in over- and under nutrition, and how the microbiota could be manipulated in a way to promote a healthy nutritional state. (Fluitman et al. 2017)

For an overview of all peer-reviewed scientific studies, please consult this webpage: <https://www.promiss-vu.eu/publications/scientific-articles/> and <https://www.promiss-vu.eu/community/researchers/>





Enriched bread with raisins and apple pie

For the PROMISS project, older adults above the age of 70 and living at home (community-dwelling) are the target group and constitute: over 90% of the older population; those with the highest absolute number of malnourished people; those whose awareness of the role of protein and the importance of protein intake is relatively low.

The PROMISS approach against malnutrition led to the creation of **two new product concepts** in the field of normalized foods (protein enriched regular products), one destined to the Dutch market and the other to the European one (WP7 - New food products and food concepts)¹. They are two bakery products fortified with dairy protein and GOS (galacto-oligosaccharides).

Fonterra led the development of these products, and the first steps resulted in the production of scones, bread with raisins and apple pie which were tested with seven different protein-powders. The protein powders have been added to standard recipes as a partial replacement for flour to keep the dry matter content of the products the same as the original recipe. In the fruit filling of the apple pie, GOS was added as a partial replacement for sugar.

Due to the high demand on manual labor, the production of scones was stopped and further improvements were made to the apple pie and bread with raisins.

Eventually two products emerged and were tested on a larger scale. The protein-content based on energy-percentage was 13.3% for the bread with raisins and 17.9% for the apple pie. A test panel of community-dwelling seniors at 'Vivent' day care for the elderly in 's Hertogenbosch tested both products. In the bread with raisins, the amount of raisins, the chewiness, the airiness, the toughness of the crust and the sweetness have been assessed with findings that the bread could be airier, and the toughness of the crust needs to be lower. For the apple pie, the brown colouring, the portion size, the amount of apple, the chewiness and the sweetness have been assessed and the panel members found that the sweetness of the pie could be enhanced more. The products are being further refined, but, in both cases, they carry the claim that they can help to counteract malnutrition.



¹ "Development of two products with an increased protein content for European community-dwelling senior subjects", thesis project 2019, FONTERRA PROMISS – Students: Sjanien Groenenboom, Laura Meulendijks, Nadi Nordkamp, Joost Linschooten (HAS University of Applied Sciences, 's-Hertogenbosch, The Netherlands), Siska ten Hoeve, Laura Dijkstra – De Jong (Fonterra Europe Coöperatie, Amsterdam, The Netherlands).



Both products were presented to the Fonterra sales teams and information was shared globally. This led to the development of a protein-enriched bread in Japan and the manufacture of small apple pies for showcasing at the FIE (Food Ingredients Europe) fair in Frankfurt end 2018.

Protein rich soups



Two students from HAS University of Applied Sciences have worked in 2018 on the development of 4 protein rich soups for Henri BV. These soups (minestrone soup, pumpkin soup, zucchini soup, kale soup) were enriched with protein in a natural way, so without the use of protein rich concentrates (such as protein powders). Challenges during the development process were: taste, salt level, consistency, product stability, quality, costs and shelf-life. From the 4 soups, one (minestrone soup) was the most promising protein enriched soup concept, since PROMISS participants indicated a high

preference for clear soup (results from WP4). Henri BV will look into the next steps that are necessary for bringing the protein enriched soup to the market.

Towards tailored dietary strategies

To determine the nutritional effects of the developed dietary strategies, as well as their sustainability, Blonk Consultants together with the Netherlands Nutrition Centre developed Optimeal®, a user-friendly tool able to find the shortest route to an adequate diet, taking into account the seniors' preferences. Optimeal® has been used to identify alternative protein sources for moving to a more sustainable and healthy diet.

A dataset has been developed which contains data on food consumption of older people, data on nutritional content and environmental impact for each food product and nutritional boundaries defining a healthy diet. This dataset has been used in Optimeal® optimization software, making it possible to grasp the full picture of health AND sustainable diets.



Daily sedentary time and physical activity among Dutch older adults

How active are we when ageing? To answer this question, the Vrije Universiteit Amsterdam² measured physical activity patterns in a large sample of Dutch older adults and examined different combined profiles (spanning full sedentary time to vigorous physical activity) across strata defined by sex, age, education, and BMI.



Longitudinal
Aging
Study
Amsterdam

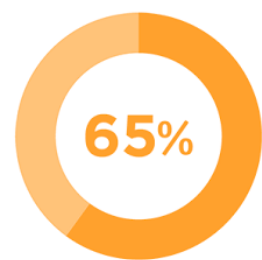
Carried out within the framework of WP2 (Daily physical activity and sedentary patterns), the study made use of cross-sectional data from 1,201 participants of the 2015-2016 examination of the Longitudinal Aging Study Amsterdam, a population-based cohort of older Dutch adults. The mean age was 71 years and 51% were women. Participants were

instructed to wear an Actigraph accelerometer for 7 consecutive days at the right hip. Time spent sedentary (less than 100 counts per minute), at light (between 100 and 2020 counts per minute), and moderate and vigorous activity (more than 2020 counts per minute) were calculated and compared across age, sex, education, and BMI groups.

The study showed that most of the time awake was spent sitting (65%) followed by light (33%), and moderate to vigorous physical activity (2%). Higher age and higher BMI were related to more time spent sedentary, while female sex and lower education were related to less time spent sedentary. The combination of high sedentary time and low physical activity was significantly associated with higher age, higher BMI, and slower walking speed compared to the combination of low sedentary time and high physical activity. This suggests that increasing light activity might be an effective and feasible strategy in older persons to reduce sedentary time.

In a nutshell, these are the key findings of the study:

- Dutch older adults spend on average 65% of their waking time sedentary.
- Sedentary time differs by age, sex, education, and BMI.
- The combination of high sedentary time and low physical activity was associated with higher age, higher BMI, and slower walking speed.



² “Daily sedentary time and physical activity among Dutch older adults”, Adriana J. van Ballegooijen, Hidde P. van der Ploeg and Marjolein Visser. European Review of Aging and Physical Activity 2019 16:3. <https://doi.org/10.1186/s11556-019-0210-9>



Nutrition & appetite under the magnifying glass

The Protein Screener 55+: interview with Dr. Hanneke Wijnhoven



The Protein Screener 55+ (Pro55+) was developed and validated by PROMISS (WP6 – Feasibility and short-term impact³) to screen for lower protein intake in community-dwelling older people. An online version is available at www.proteinscreener.nl, and it is our pleasure to share a short interview with one of its architects: Dr. Hanneke Wijnhoven.

Dr. Hanneke Wijnhoven is an epidemiologist and works as Assistant Professor at the Department of Health Sciences and the Amsterdam Public Health Research Institute in the Netherlands. Besides teaching bachelor and master students Health Sciences, she conducts research on the impact of healthy lifestyle on healthy aging, with a specific focus on nutrition and the role of gender.

For PROMISS, she studies the impact of protein on physical function in older persons and she hereby explains how the idea of a food questionnaire for screening of protein intake came up.

“In PROMISS we study the effects of protein on physical function whilst aging. We will examine the long-term effect of increasing protein intake in older adults who consume little protein within their regular diet, amongst other outcomes. We therefore needed a feasible tool for researchers to quickly screen for lower protein intake. With existing data from two large cohort studies in the Netherlands (LASA and HELIUS), we successfully developed and validated such a tool”

Currently available in Dutch, Finnish and English, the Protein Screener is an essential tool for researchers around Europe and beyond. In the words of Dr. Wijnhoven:

“First of all, we, as researchers, already use the screener in PROMISS to include older adults with a lower protein intake in our short and long-term studies on the effects of extra protein on physical function. Only when there is enough scientific evidence that extra protein has positive effects on physical function of older people, can the screening tool be transformed into a tool to be used in clinical practice. One can think of screening older adults in clinical practice or the development of a self-screener for older people to be used at home. Of course,

³ Wijnhoven HAH, Elstgeest LEM, de Vet HCW, Nicolaou M, Snijder MB, Visser M. Development and validation of a short food questionnaire to screen for low protein intake in community-dwelling older adults: The Protein Screener 55+ (Pro55+). PLoS One. 2018;13(5):e0196406



the screener gives an indication of a possible lower protein intake and should always be followed by a more thorough assessment of protein intake by a professional”.

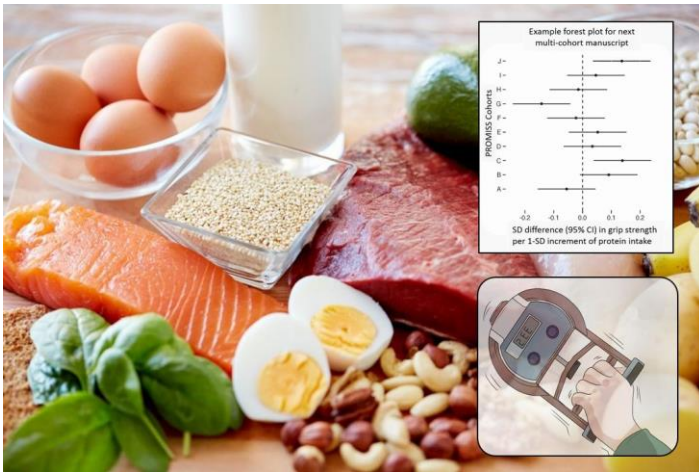
In terms of impacts, Dr. Wijnhoven wants the screener to help achieve optimal nutrition for healthy aging for more people throughout Europe. *“When extra protein intake benefits physical function with aging, the screener can have a major impact. However, the results of the PROMISS project are needed first before we can make the next step”.*

What’s next? Will the Protein Screener be available also in other languages?

“Danish research partners within the PROMISS consortium translated the tool into Danish and used a paper version in their studies. We certainly hope to add other languages to the tool and hope to collaborate with researchers from other countries to make the screener more country specific”.

What comes next?

Pooling individual participants’ data with cohort’s data



PROMISS researchers in WP1 (Dietary characteristics, daily food intake patterns and clinical outcomes) are currently working on various studies.

The next multi-cohort paper will examine protein intake and muscle strength by pooling individual participant data from all cohorts within PROMISS.

Part of the study will also determine how appetite can vary by physical function in the Icelandic cohort.

Further work in the labs

Within the labs, PROMISS researchers on WP2 (Daily physical activity and sedentary behaviour patterns) decided to add the assessment of energy expenditure during free-living conditions for 14 days while wearing multiple accelerometers.

With this new method, they aim to identify whether energy expenditure collected over a longer period during unrestricted free-living activities correlates better with accelerometers placed at different body locations. This additional method will help develop an appropriate algorithm and translate “counts” recorded from different anatomic locations into a common metric (e.g. relative intensities, volume, fluctuation of activity level during the day).



Testing dietary strategies

PROMISS researchers in WP6 (Feasibility and short-term impact) examined whether older adults at risk of lower protein intake were able to increase their protein intake over a 4 weeks period after receiving dietary advice. They tested two dietary advice strategies aimed at increasing protein intake: an “even” distribution of protein over the day and a “peak” distribution of protein at one meal moment.

In total, 57 older adults participated in the experiment. They were randomly assigned to the “even”, “peak”, or “control” group. Researchers examined protein intake after 4 weeks by interviewing participants on their food intake over 3 days (24-hour recalls). Results of these tests will be publicly available over the summer of 2019.

Upcoming international events for PROMISS

- **ESPEN** is the largest European congress on **Clinical Nutrition and Metabolism**, with approximately 3000 attendants every year (medical doctors, dietitians, nurses, pharmacists). This year it will be held in Krakow, Poland, from 31 Aug- 3 September. Malnutrition, protein and older adults are among the main topics of this congress. A special session, dedicated to PROMISS results, will be held on Saturday August 31, from 10-11.30. <https://espencongress.com>
- On September 25th-27th 2019, the **European Geriatric Medicine Society (EuGMS)** will offer a unique opportunity for spreading geriatric expertise and attitude across central Europe and in particular those countries where geriatric medicine is still emerging. There will be a PROMISS symposium, please join us in Kraków, Poland at the 15th International Congress of the EuGMS. <https://www.eugms.org/2019.html>
- From October 15th to 18th, the **European Nutritional Conference FENS** will take place in Dublin, Ireland, with the theme ‘Malnutrition in an obese world: European perspectives’. There will be a PROMISS symposium. Please see: <http://www.fens2019.org/programme/>
- On November 1st and 2nd 2019, EFAD congress will take place in Berlin, Germany. Developing the theme “Breaking Professional Boundaries”, **EFAD - the European Federation of the Associations of Dietitians** will launch its 41st congress that aim at gathering over 600 dietitians and nutritionists. PROMISS will be promoted in this setting. For more information and early bird registrations: www.efadconference.com.

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