Development of innovative food-based fortification solutions to sustain health in older people using a co-creation approach

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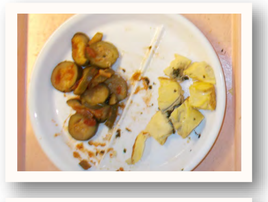
Small eaters in old age

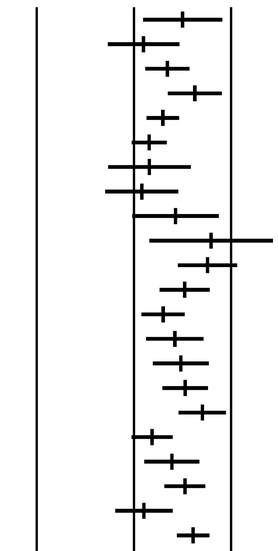


Several epidemiological studies highlighted a *small eater* pattern ranging from 23% to 55% in community-dwelling older population[1].

Two recent studies have shown that about two thirds of dependent older people do not meet their protein requirements[2].

Insufficient protein intake leads to loss of muscle mass and impaired immune function, with negative effects on the autonomy and health of older people. In fact, poor appetite is a strong and major determinant of protein-energy undernutrition[3].

After 65 years old:
1 to 1.2 g of protein
per kg of body weight per day



Food-based fortification

Food-based fortification consists of incorporating ingredients of nutritional interest (*fortificants*) into everyday foods without increasing the volume to be ingested.

Fortificants can be:

- ✓ **Regular food products (semolina, oils, butter, cream, pureed nuts, egg…)**
- ✓ **Macronutrients extracts (whey protein isolate, milk protein concentrate, caseinate, maltodextrin…)**

Fortification is a flexible solution that allows better adaptation to older people's food preferences and better guarantees the maintenance of a varied diet.

Systematic literature review:
significant increase in protein intake and body weight[4]

Bridging the gap between nutrition and sensory

Systematic review reveals the acceptability of fortified recipes is seldom done:

- ✓ **Identification of 44 original studies on fortification in older people[4]**
- ✓ **Only 10 reported both nutritional and acceptably outcomes**
- ✓ **The quality of acceptability testing is often poor: low sample size & convenient sample, qualitative tests, incomplete reporting**

Acceptability is more than liking: we need to design fortified foods that people will choose to buy, cook, eat and enjoy, in order to ensure nutritional efficacy.

Fortiphy

Database of protein extracts

A database including all protein extracts available on the EU market was built. Each product was assessed on the following domains:

- ✓ **Technology**
- ✓ **Regulatory**
- ✓ **Sustainability**
- ✓ **Sensory**
- ✓ **Nutrition**

135 products were identified
38% from animal and 50% from plant
Protein rate varies from 9 to 98%

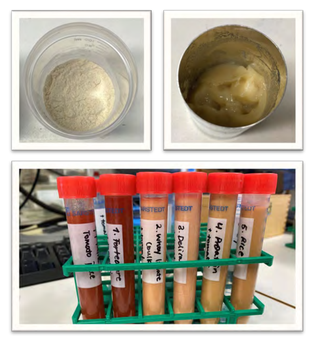
Usage constraints

Focus groups were conducted in each country (FR, N, UK) with older people and caregivers to gather insights on attitudes to usage of high-protein ingredients

- ✓ **Nutrition awareness**
- ✓ **Fortification**
- ✓ **Proteins extracts**

Posters on session 2
ECR2.1 **ECR2.3**

Technological constraints



Eleven protein extracts were selected and assessed for their technological constraints

- ✓ **Tested in water, milk and tomato juice**
- ✓ **Cooking stirring viscometer**
- ✓ **Gas Chromatography/Mass Spectrometry**

Major challenges:
formation of aggregates when heated, increased viscosity and lipid oxidation

Development of fortified recipes

Several recipes were developed by a chef in collaboration with a food technologist and a nutritionist

- ✓ **Culinary ingredients (dairy, almonds, eggs…)**
- ✓ **2 protein extracts (milk protein & extruded soya)**
- ✓ **Cooking from scratch and from ready-to-heat**

Each recipe provides an additional load of 10-12g of protein and 250-300 kCal

Home-usage tests

Home-usage tests were conducted in three countries (FR, N, UK) with people aged over 70 (n=50 per country)

- ✓ **Ease of preparation and palatability**

Additional central location tests were conducted in France to compare standard *versus* fortified food (n=56; 37 ♀; 70-84 yo)

Fortified foods (*M*=4.6/7; *SE*=1.7) are less liked than standard foods (*M*=5.2/7; *SE*=1.4; *p*<0.001)

1. Schroll 1996 Eur J Clin Nutr; Corrêa-Leite 2003 Eur J Clin Nutr; Samieri 2008 J Am Diet Assoc; Gazan 2016 Brit J Nutr; Thortpe 2016 Int J Behav Nutr Phy; 2. Borkent 2019 J Nutr Sci; Sulmont-Rossé 2019 Cah Nut Diet; 3. Pols-Vijlbrief 2014 Ageing Res Rev; 4. Geny submitted Clin Nut;