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# ARE INDUSTRY-MADE AND HOME-MADE FOODS SIMILAR IN NUTRITION COMPOSITION AND LEVELS OF POTENTIALLY HARMFUL COMPOUNDS? A COMPARATIVE STUDY

Beatrice Pellegrini – beatrice.pellegrini@unimi.it

Beatrice Pellegrini (beatrice.pellegrini@unimi.it) Division of Human Nutrition, Department of Food, Environmental and Nutritional Sciences (DeFENS), Università degli Studi di Milano, 20133 Milan, Italy  
Tutor: Daniela Martini- daniela.martini@unimi.it

## Introduction

The realization and comparison in nutrients profile and presence of Maillard Reaction derivatives (MRd) of four common home-made (HM) versions of four industry-made (IND) products commonly found on the Italian market. This research project has been carried out at the Wageningen University and Research aiming at elucidate differences between products prepared in these two different settings, in terms of nutritional composition and presence of potentially harmful compounds deriving from the MR.

Investigation of the role of ultra-processed foods (UPF) in modulating health and planet health: the PROMENADE study. The Epidemiological evidence suggests that consumption of UPF may be detrimental to human health, but there is only one clinical trial on this topic, largely debated in the scientific community. Is in this context that in February 2024 the PROMENADE study started with the aim of exploring whether the inclusion of UPF within a Mediterranean-based dietary pattern can impact cardiometabolic markers, gut microbiota and other health markers in a real-life dietary intervention performed in Italian subjects.

## Materials and methods

Four IND foods (plumcake, fish sticks, tomato sauce, and cereal bars) were replicated in home-like setting, excluding processing technologies and substances not commonly used in HM processing, according to the NOVA classification (1). The HM products were then analyzed and compared to the IND versions for their nutritional profiles and the presence of Maillard reaction derivatives (MRd). Nutritional composition analysis was performed by an external lab using standard official analytical protocols, MRd were extracted and quantified.

Fifty clinically healthy subjects with low-to-moderate cardiovascular risk will participate in a 7-month randomized, cross-over trial, comparing a high-UPF Mediterranean diet to a low-UPF Mediterranean diet, with a 1-month wash-out period. Several markers of human health, including markers of cardiometabolic risk and gut microbiota together with the level of food waste will be investigated. The study design is shown in Figure 1. This project started on February 2024 and is still on going.

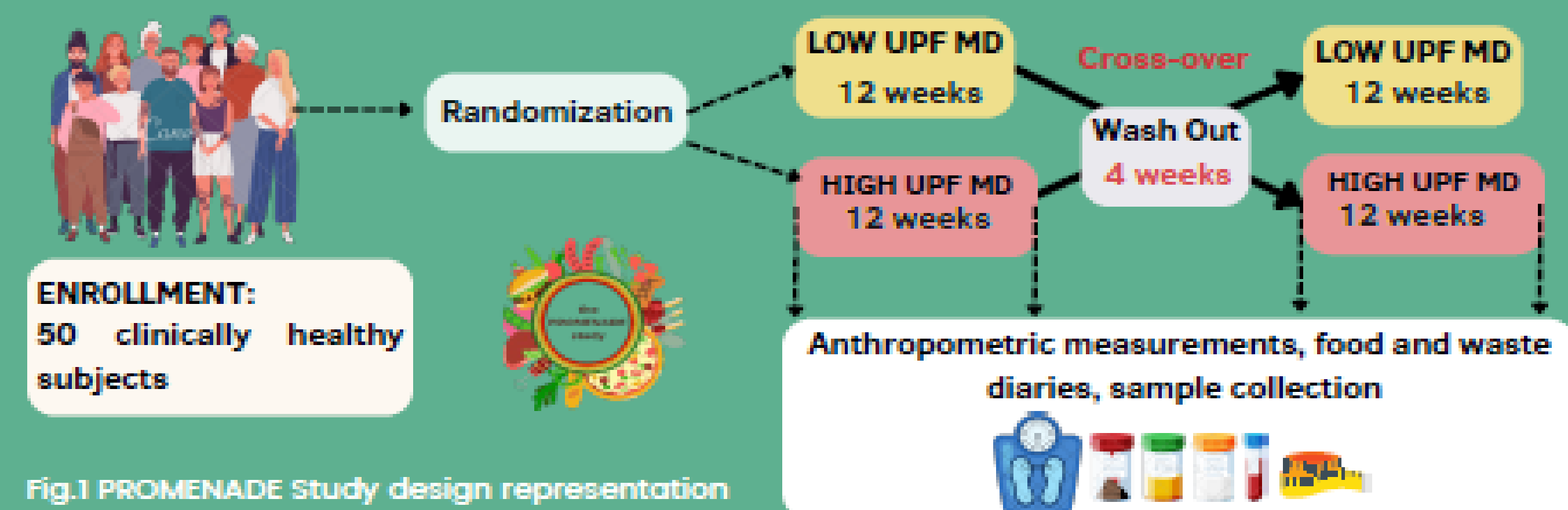
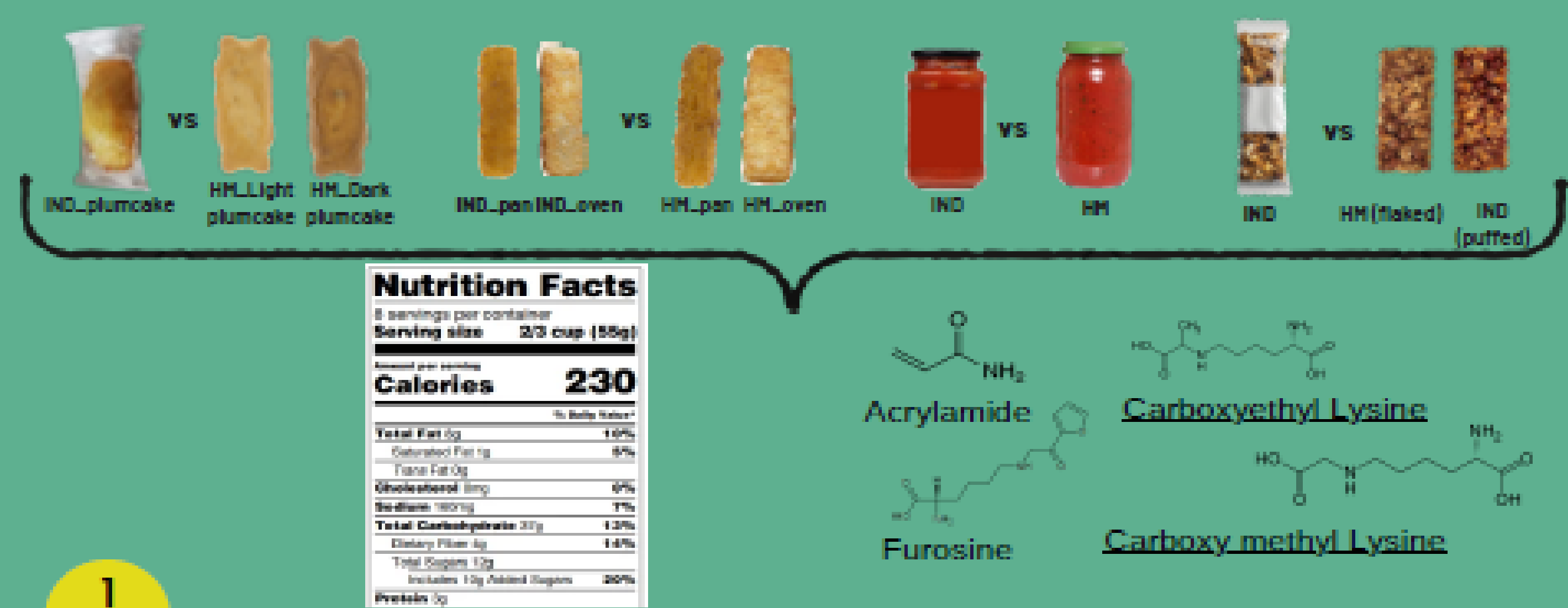


Fig.1 PROMENADE Study design representation

Figure 1. Study design of the human intervention study.

Legend: LOW UPF MD includes 5 portions UPF/day less than HIGH UPF MD

## Results

Nutritional analysis revealed identical compositions for all the foods studied. Significant difference in fat content ( $p < 0.005$ ) was found for fish sticks, more related to the cooking methods used (oven vs. pan), rather than the processing settings. HM foods are not exempt from the formation of undesirable compounds during cooking as confirmed by the data showed in Table 1. These findings challenge the perception that HM foods are inherently healthier or safer than industrial foods.

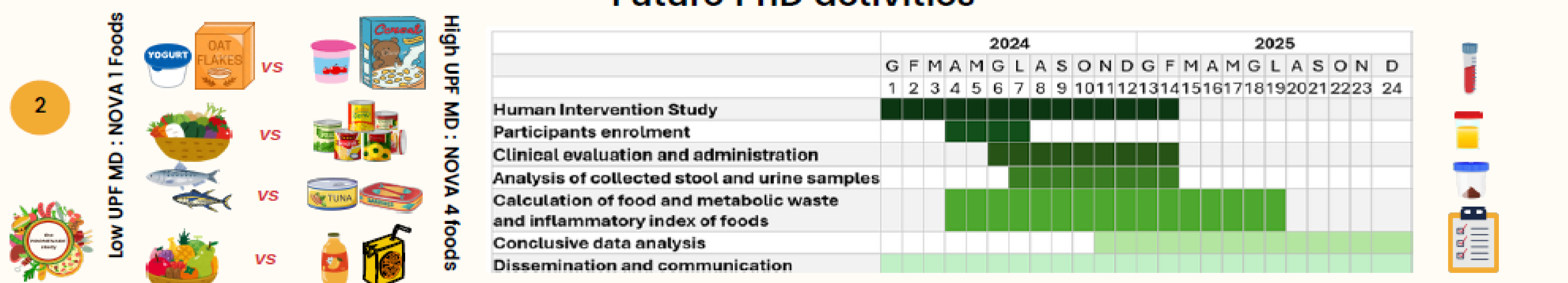
Table 1 Quantities of potentially harmful compounds acrylamide (AA), Furosine, Nε-(carboxyethyl)-l-lysine (CEL) and Nε-carboxymethyl-lysine (CML). Data are presented as mean ± sd.

	Plumcakes			Cereal bars		Fish Sticks		
	IND	HM_Dark	HM_light	IND_puffed	HM_flaked	IND_Oven	IND_Pan	HM_Oven
<b>Acrylamide</b> (µg/kg)	<LOQ	11.7 ± 0.5	<LOQ	153.9 ± 3.4	<LOQ	29.8 ± 1.4	26.8 ± 0.4	56.6 ± 1.1
<b>Furosine</b> (mg/100g)	3.5 ± 0.2	3.1 ± 0.2	2.1 ± 1.0	0.2 ± 0.1	0.3 ± 0.1	0.7 ± 0.1	0.6 ± 0.1	0.8 ± 0.1
<b>Carboxymethyl-lysine (CML)</b> (mg/100g)	1.6 ± 0.1	1.2 ± 0.3	1 ± 0.5	0.6 ± 0.1	0.2 ± 0.1	0.6 ± 0.0	0.5 ± 0.2	0.7 ± 0.1
<b>Carboxyethyl-l-lysine (CEL)</b> (mg/100g)	1.5 ± 0.2	2.0 ± 0.4	0.8 ± 0.6	0.2 ± 0.0	<LOQ	0.8 ± 0.1	0.7 ± 0.0	0.9 ± 0.0

## Conclusions

Further research is needed to better elucidate health impacts of food processing methods, including effects on satiety, metabolism, and long-term health. In this regard, a future in vivo human trial will be conducted in the next PhD year, to contribute to the debate about the impact of food processing on human health.

## Future PhD activities



(1) Monteiro C.A., Cannon G., Levy R.B. et al., 2016 . NOVA. The star shines bright. Food classification. Public health, World Nutrition, vol. 7, n. 1-3, pp. 28-38

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"Characteristics and role of food labeling in facilitating the transition to healthy and sustainable diets: nutritional, health and regulatory aspects"