

# PROTEIN AEROGELS AS FUNCTIONAL INGREDIENTS ABLE TO REPLACE FAT AND MODULATE LIPID DIGESTION

Lorenzo De Berardinis\*, Stella Plazzotta, Sonia Calligaris, Lara Manzocco

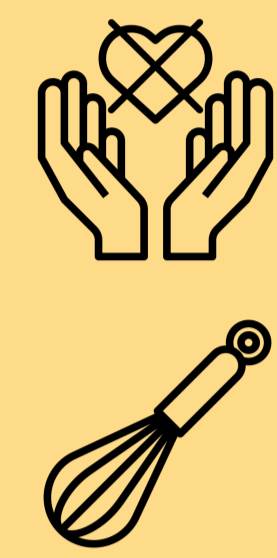
\*e-mail: [deberardinis.lorenzo@spes.uniud.it](mailto:deberardinis.lorenzo@spes.uniud.it)

\*WhatsApp: +39/3898412924

## Overview

- The relation between saturated fat consumption and **chronic diseases** (e.g., cardiovascular diseases) is well-established (Zhu *et al.*, 2019).
- The substitution of **saturated fats** (e.g., butter, palm oil, margarine), solid at ambient temperature, with liquid oil (rich in **unsaturated fatty acids**) is challenging due to their unique technological and sensorial properties.
- A possible solution is to structure oil into semi-solid materials (**oleogels**) by different "oleogelation" strategies. Among them, the **aerogel template approach** is based on oil absorption into porous aerogel particles (Plazzotta *et al.*, 2020).
- No knowledge is currently available on the digestibility of aerogel-templated oleogels, neither on their applicability in real foods.

## Introduction



Saturated fat content

Technological functionality

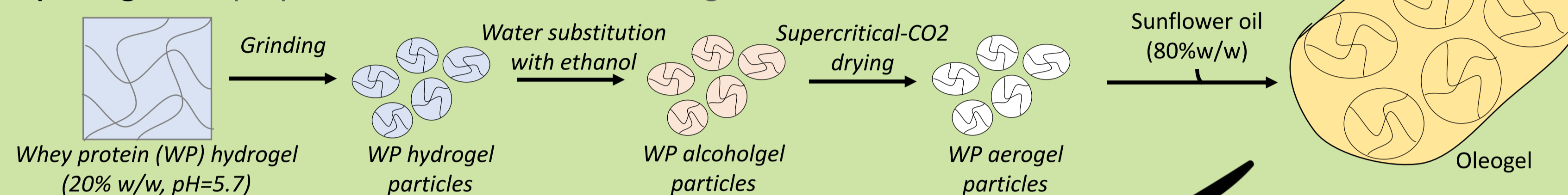
	Fats	Oleogels	Oils
Saturated fat content	High	Low	Low
Technological functionality	High	High	Low

## Aim

The aim of the present study was to assess the effect of aerogel-template oleogelation on **lipid digestibility** and in the development of **low-saturated fat cocoa creams**.

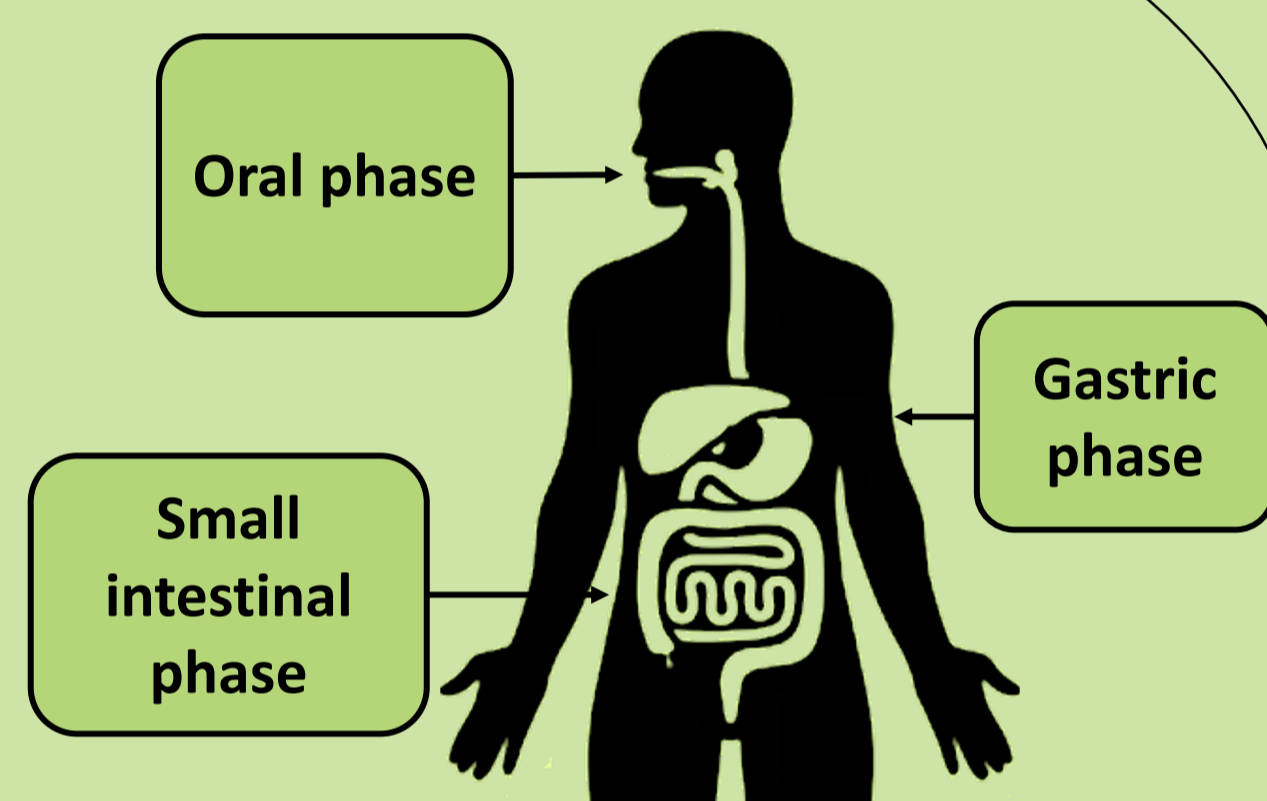
## Materials and Methods

Whey protein (WP) aerogel was prepared and converted into oleogel:



### Oleogel digestibility

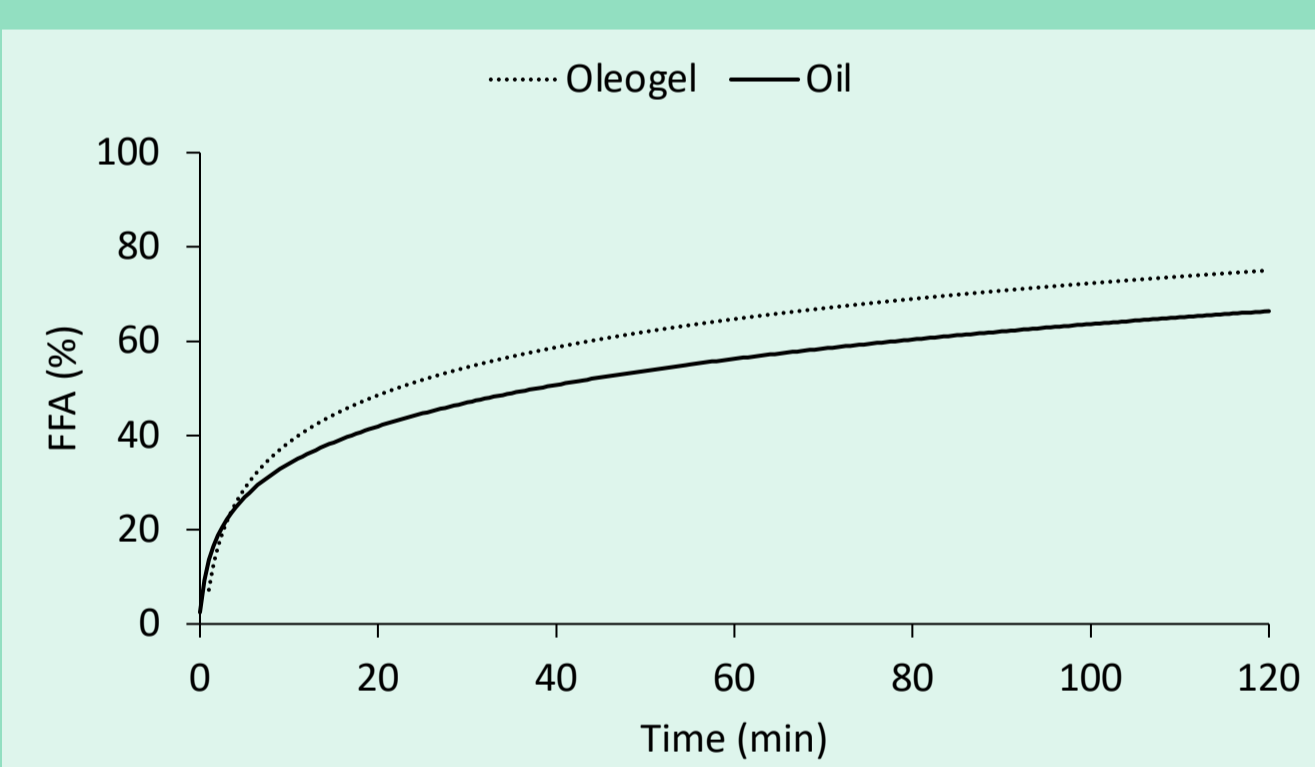
- Samples were assessed for the *in vitro* digestibility following the INFOGEST protocol (Brodkorb *et al.*, 2019).
- The **pH-stat method** was used to assess the lipolysis, expressed as free fatty acids (FFA %).
- The digestate structure was analyzed by using **dynamic light scattering (DLS)** and **confocal microscopy**.



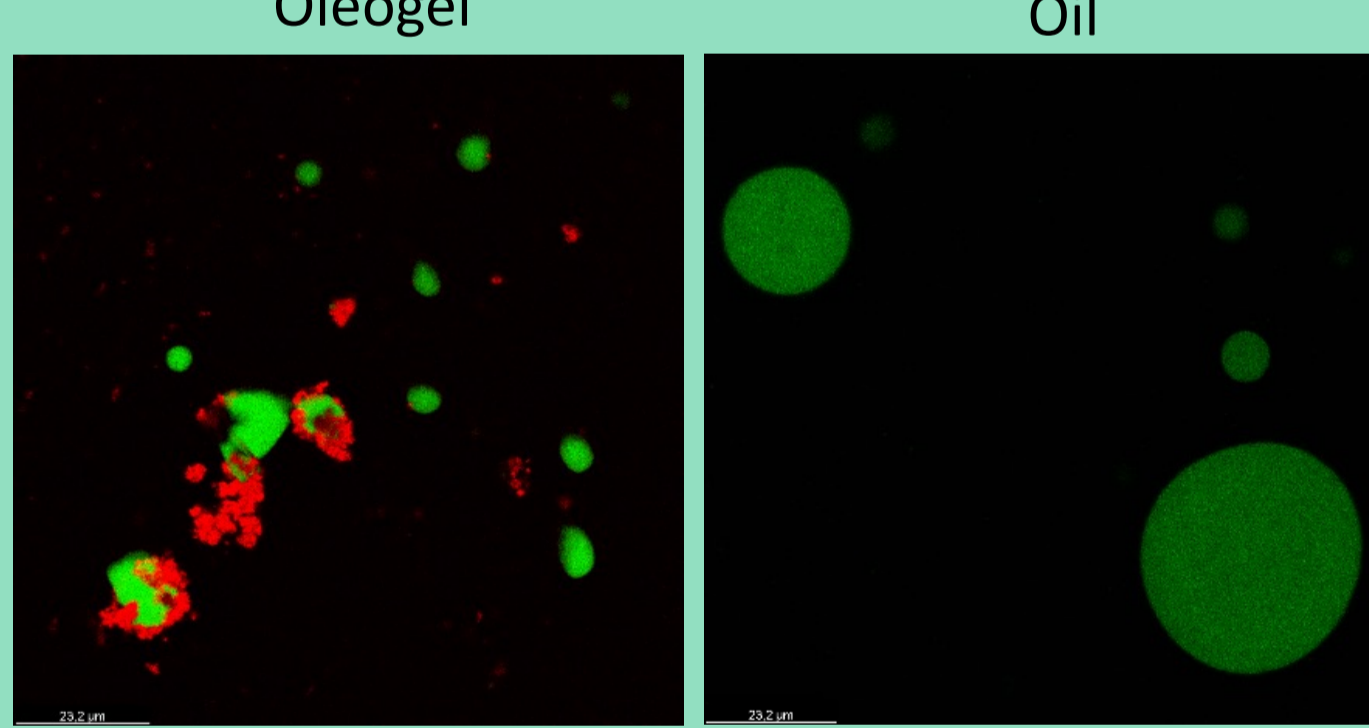
### Low-fat cocoa cream

- Creams** were prepared by mixing dry ingredients with oleogels containing increasing amount of oil. Analogous control samples were prepared with WP isolate.
- Creams were analyzed for **oil release**, **rheological properties (viscosity at 50 1/s)**, compared to cocoa spreads available on the market.

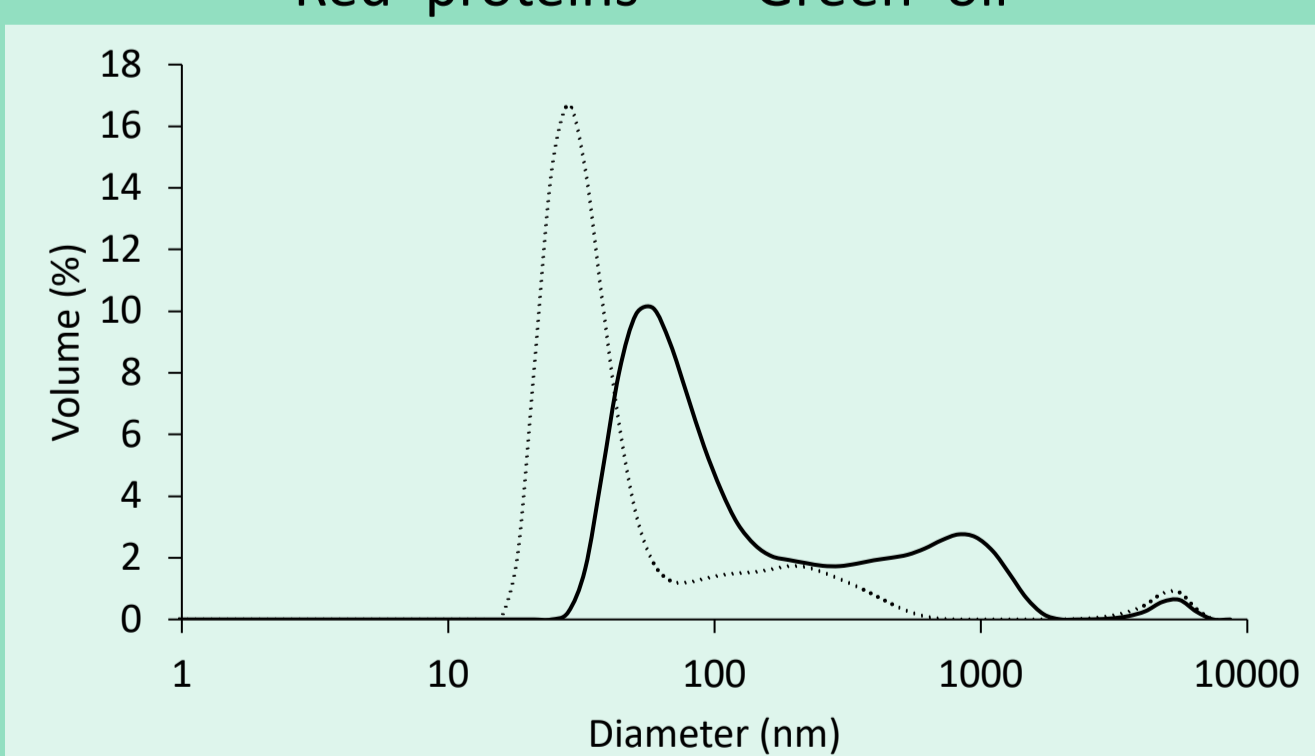
## Results and Discussion



- The lipid digestibility of the oil in the **oleogel (80%) resulted higher** than that of SO alone (70%).



- Confocal microscopy during intestinal phase shows that aerogel particles improved **oil emulsification** during digestion, favoring lipase activity.



- As compared to oil, the digestion of the oleogel led to **micelles of lower size**.



- WP isolate did not present oil structuring ability.

- WP aerogel particles produced thicker creams, and no oil release during storage at room temperature.

- Structural features **comparable** to those of different commercial products were obtained.

## Conclusions

- WP aerogels are able to structure oils.
- Oleogelation *via* the WP-aerogel template approach does **not compromise lipolysis**, making aerogels suitable carriers of lipophilic bioactives in the gastrointestinal tract.
- Oleogels** were successfully used in the development of real healthier food products (reduced fat cocoa creams).

**Aerogels as potential ingredient for the generation of novel food with improved functionalities**

### References

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