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# In vitro digestion of age-tailored dairy products in the ageing gastrointestinal tract

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## Introduction

### Context

- For older adults (> 65 y.) insufficient protein intake can lead to sarcopenia, characterized by the loss of muscle mass, strength, and function.
- To avoid this condition healthy older adults need to increase the amount of high-quality proteins in their diet (at least 1g protein/kg body weight/day).
- Milk proteins are interesting to promote muscle health, and particularly whey proteins which are rich in leucine.
- Ageing leads to changes in the functionality of the digestive tract but the impact of ageing on the intake, digestion, and absorption of nutrients is still unclear.

### Objective

Investigate the digestion of 2 high-protein (10 % w/w) dairy products, in different *in vitro* conditions, to compare the kinetics of proteolysis in the gastric and intestinal phase between "young" and older adults.

### High-protein products

- WBD** = fermented dairy product formulated with a ratio of whey proteins to caseins of 80 to 20% (as opposed to milk),
- Skyr** = fermented dairy product containing mainly caseins.

### Static *in vitro* digestion<sup>1</sup>

#### Oral phase

1: 1 food: SSF dilution according to dry matter  
pH = 7.0, no chewing, no amylase

#### Gastric phase

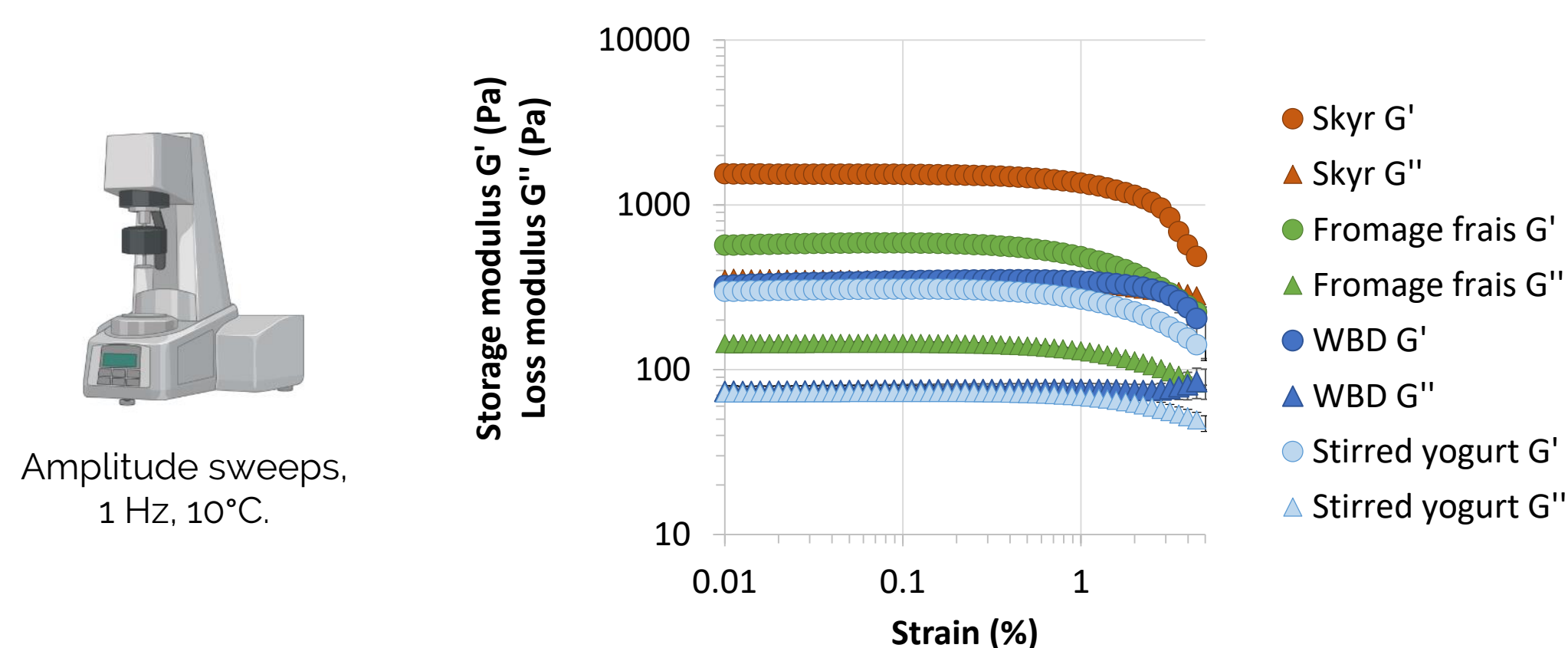
	Young adults	Older adults
pH:	3.0	3.7
Duration:	2 h	3 h
Pepsin:	2000 U ml <sup>-1</sup>	1200 U ml <sup>-1</sup>
Gastric lipase:	60 U ml <sup>-1</sup>	36 U ml <sup>-1</sup>

#### Intestinal phase

	Young adults	Older adults
[Ca <sup>2+</sup> ]:	0.6 mM	1 mM
pH:	7.0	7.0
Duration:	2 h	2 h
Pancreatin:	100 U ml <sup>-1</sup>	80 U ml <sup>-1</sup>
Bile salts:	10 mM	6.7 mM

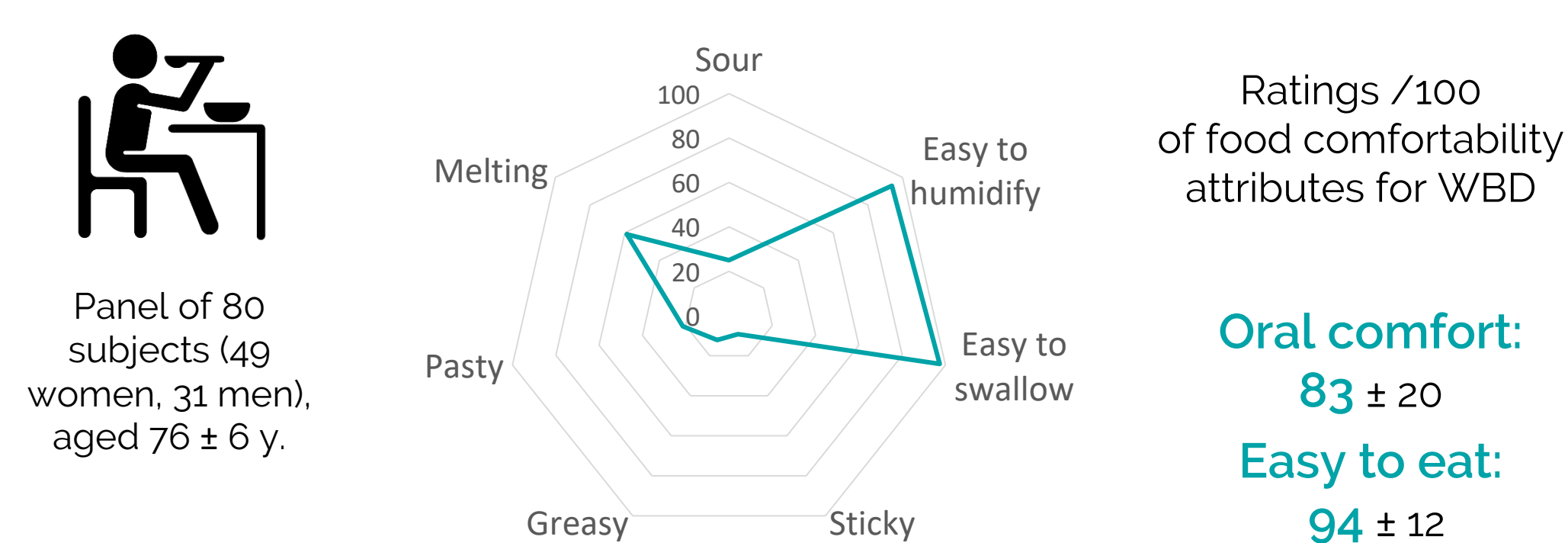
## Results

### Rheological properties



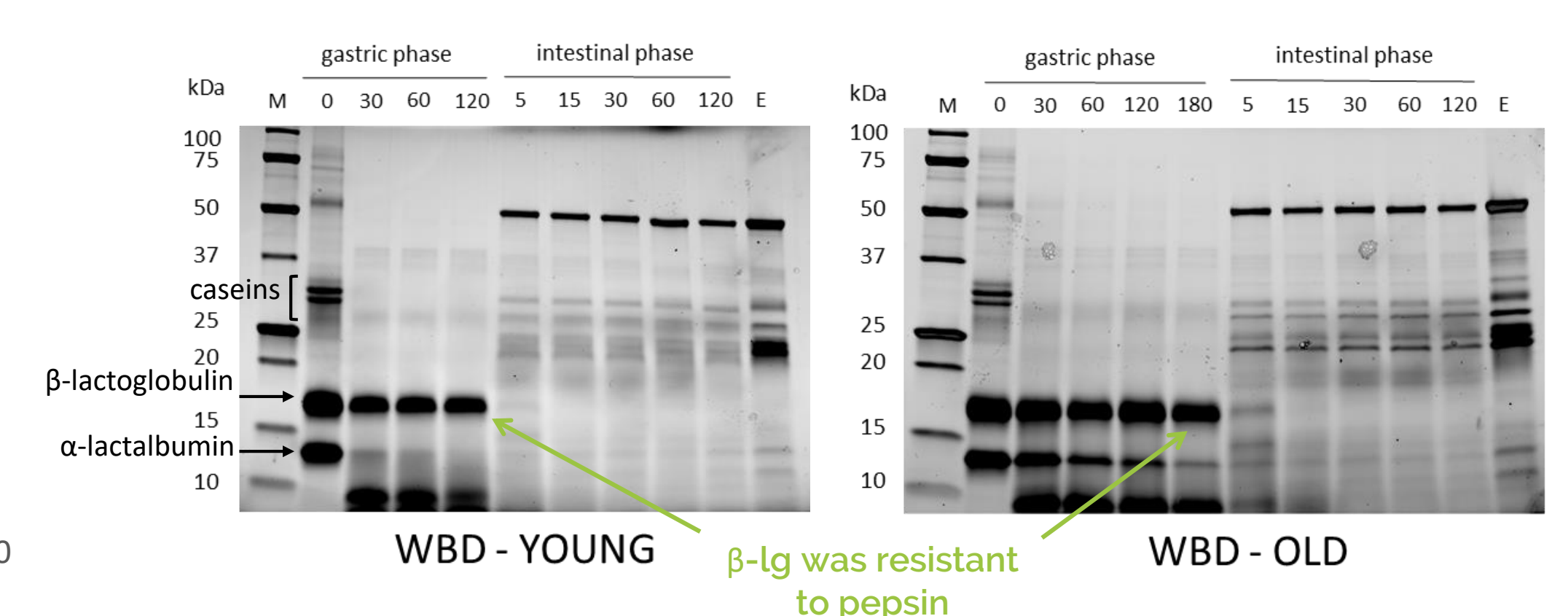
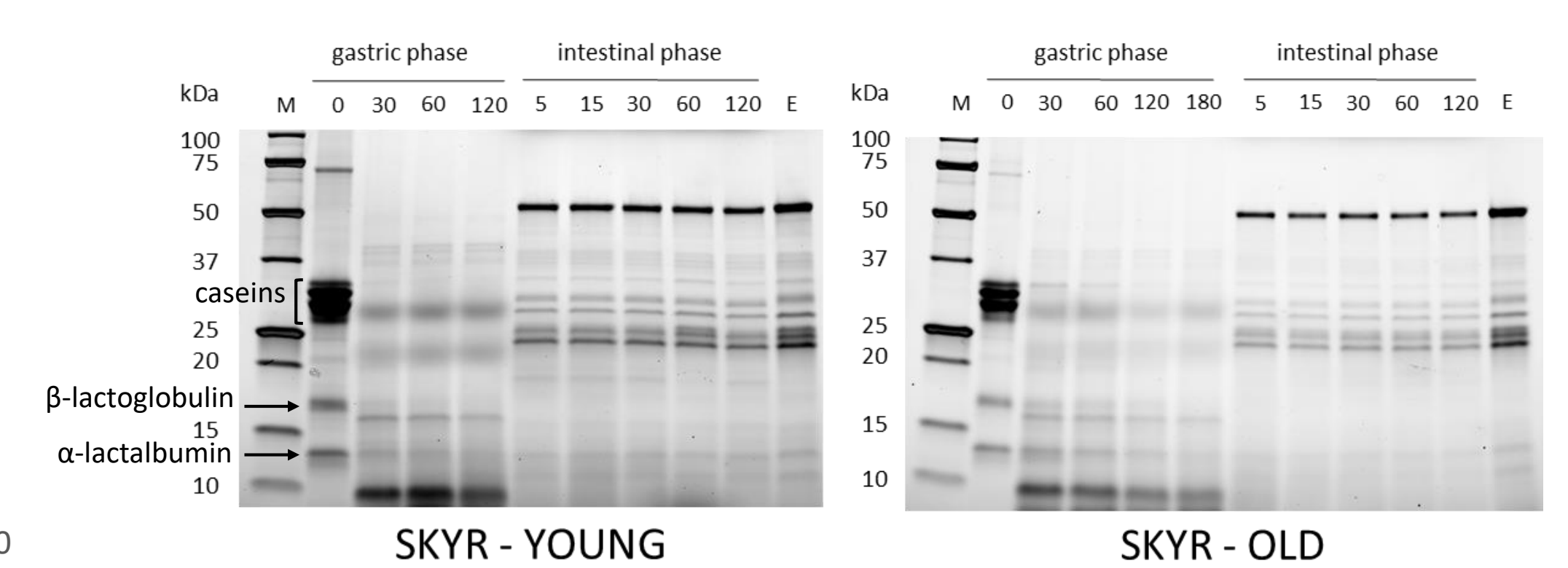
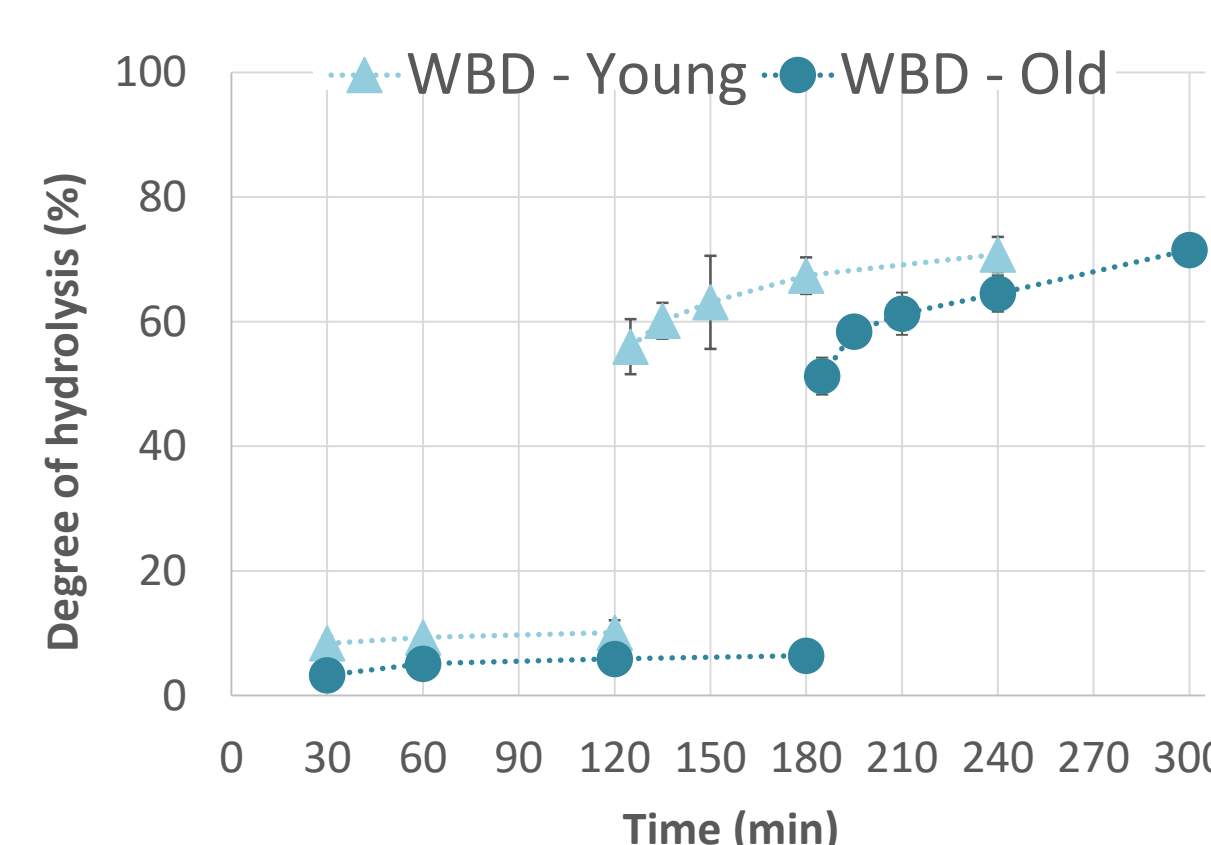
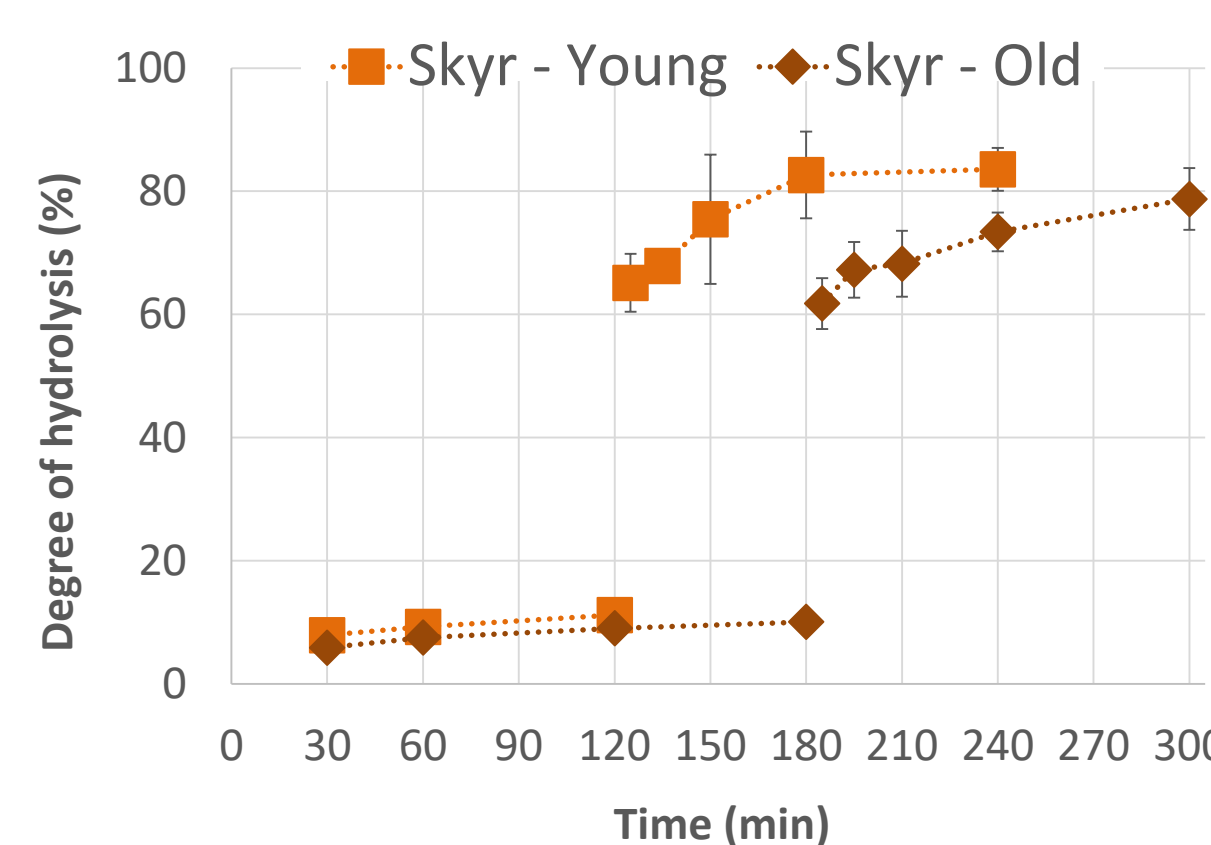
WBD had rheological properties comparable to a stirred yogurt and was considered suitable for older adults in terms of texture.

### Sensory analysis<sup>2</sup>



No relationships were observed between oral physiology (posterior functional units, salivary flow, and saliva viscosity) and comfort.

### Young vs. older adults' digestion of the dairy products



#### Gastric phase:

- Decrease in pepsin concentration (~30%), and increase in pH (from 3 to 3.7) between models resulted in a reduction in protein hydrolysis
- Caseins were rapidly digested by pepsin even at pH 3.7
- Proteolysis depended on the composition & structure of the product

**Intestinal phase:** no significant differences in proteolysis were measured at the end of the digestion between models.

## Conclusions

- The whey protein-based dairy product developed in this study is suitable for older adults.
- The digestion conditions used (young vs. older adult) influenced significantly the kinetics and extent of proteolysis in the gastric phase but not in the intestinal phase.
- A clinical study comparing the effect of WBD or Skyr on older adults' postprandial muscle synthesis is underway.

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<sup>1</sup> Ménard, O. et al. *Food & Funct.*, 2023, 14, 4569.

<sup>2</sup> Vandenbergue-Descamps M. et al. *Food Quality & Preference*, 2018, 57-67