In vitro digestion of two age-tailored dairy products in the aging gastrointestinal tract

Anaïs Lavoisier, Martine Morzel, Cindy Sounouvou, Bérénice Houinsou-Houssou, Chantal Septier, Carole Tournier, Gilles Feron, Didier Dupont

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A. Lavoisier [a], M. Morzel [a], C. Sounouvou [b], B. Houinsou-Houssou [b], C. Septier [b], C. Tournier [b], G. Feron [b], D. Dupont [a]

[a] UMR STLO, INRAE, Institut Agro, Rennes, France
[b] UMR CSGA, INRAE, Dijon, France

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 [1]

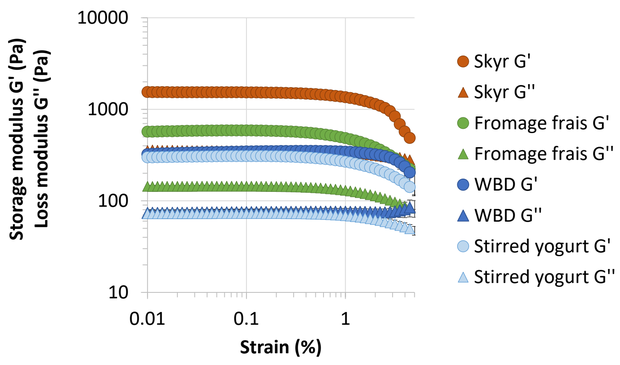
Oral phase
1: 1 food: SSF dilution according to dry matter
pH = 7.0, no chewing, no amylase

	Young adults	Older adults
Gastric phase		
pH:	3.0	3.7
Duration:	2 h	3 h
Pepsin:	2000 U ml^{-1}	1200 U ml^{-1}
Gastric lipase:	60 U ml^{-1}	36 U ml^{-1}
Intestinal phase		
$[Ca^{2+}]$:	0.6 mM	1 mM
pH:	7.0	7.0
Duration:	2 h	2 h
Pancreatin:	100 U ml^{-1}	80 U ml^{-1}
Bile salts:	10 mM	6.7 mM

Results

Rheological properties

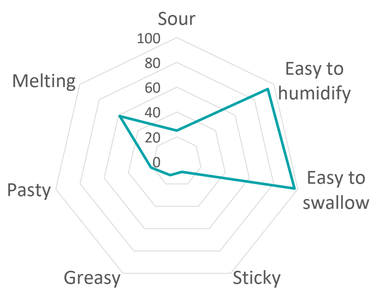
Amplitude sweeps, 1 Hz, 10°C.



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

Sensory analysis [2]

Panel of 80 subjects (49 women, 31 men), aged 76 ± 6 y.

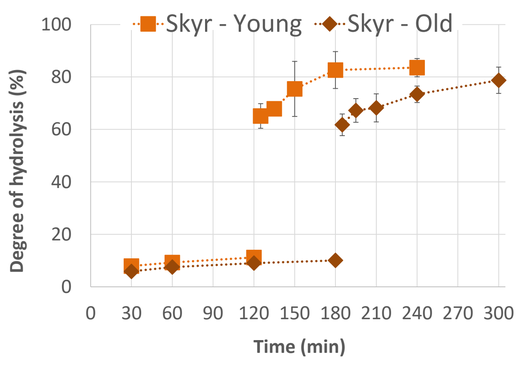


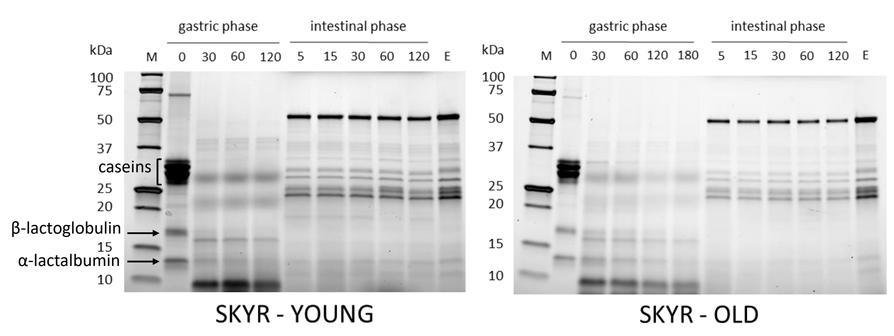
Ratings /100 of food comfortability attributes for WBD

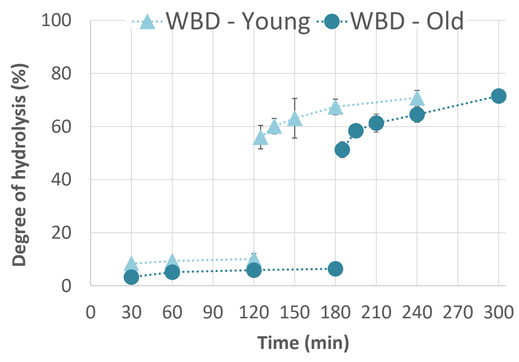
Oral comfort:
83 ± 20
Easy to eat:
94 ± 12

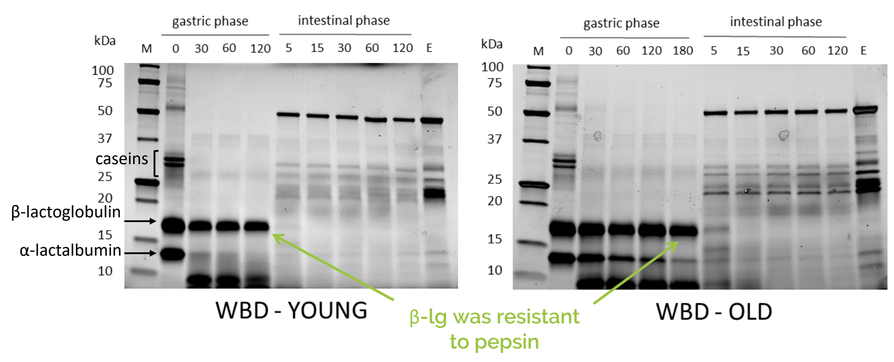
No relationships were observed between oral physiology (posterior functional units, salivary flow, and saliva viscosity) and comfort.

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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[2] Vandenbergue-Descamps M. et al. Food Quality & Preference, 2018, 57-67

anais.lavoisier@inrae.fr