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In vitro digestion of protein-rich dairy products in the ageing gastrointestinal tract

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➤ Digestibility interest of dairy proteins

In vitro digestion of protein-rich dairy products in the ageing gastrointestinal tract

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INRAE



➤ Interest of dairy proteins – Muscle health

- Milk proteins are considered high-quality proteins (*Hoffmann & Falvo, 2004*):

All essential amino acids

+

High digestibility ratings

- Particularly interesting to promote muscle health
- Synergistic effect between caseins and whey proteins in milk to sustain the anabolic requirements during the whole postprandial period (*Lacroix et al., 2006*):

Caseins → Slowly digested → Sustained release of amino acids

Whey proteins → Rapidly digested & Rich in leucine → Stimulate protein synthesis



➤ Interest for specific populations – Older adults

- Insufficient protein intake can lead to sarcopenia, characterized by the loss of muscle mass, strength, and function.
- Healthy older adults (> 65 y.) need to increase the amount of high-quality proteins in their diet (1 g protein /kg body weight /day). *ESPEN guidelines*
- Ageing leads to changes in the functionality of the digestive tract but the impact of ageing on digestion, and absorption of nutrients is still unclear (*Lee et al., 2021*).

➔ Investigate high-protein dairy products digestion *in vitro*

➔ Study the influence of age on the kinetics of proteolysis in the gastric and intestinal phase of digestion



➤ *In vitro* digestion of SKYR

- High-protein fermented dairy product (10% w/w): “SKYR”
- Static *in vitro* digestion

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

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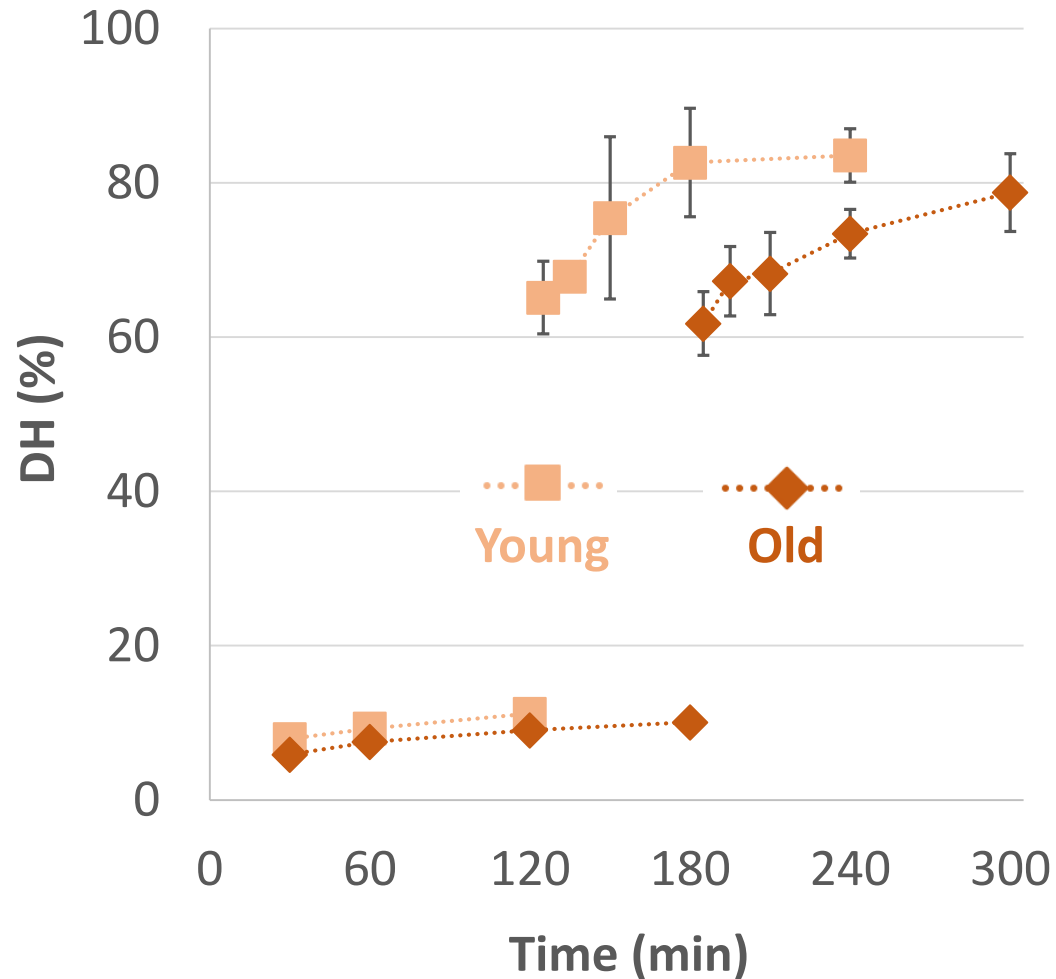


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Static *in vitro* digestion model adapted to the general older adult population: an INFOGEST international consensus

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➤ Results: Degree of hydrolysis (DH)



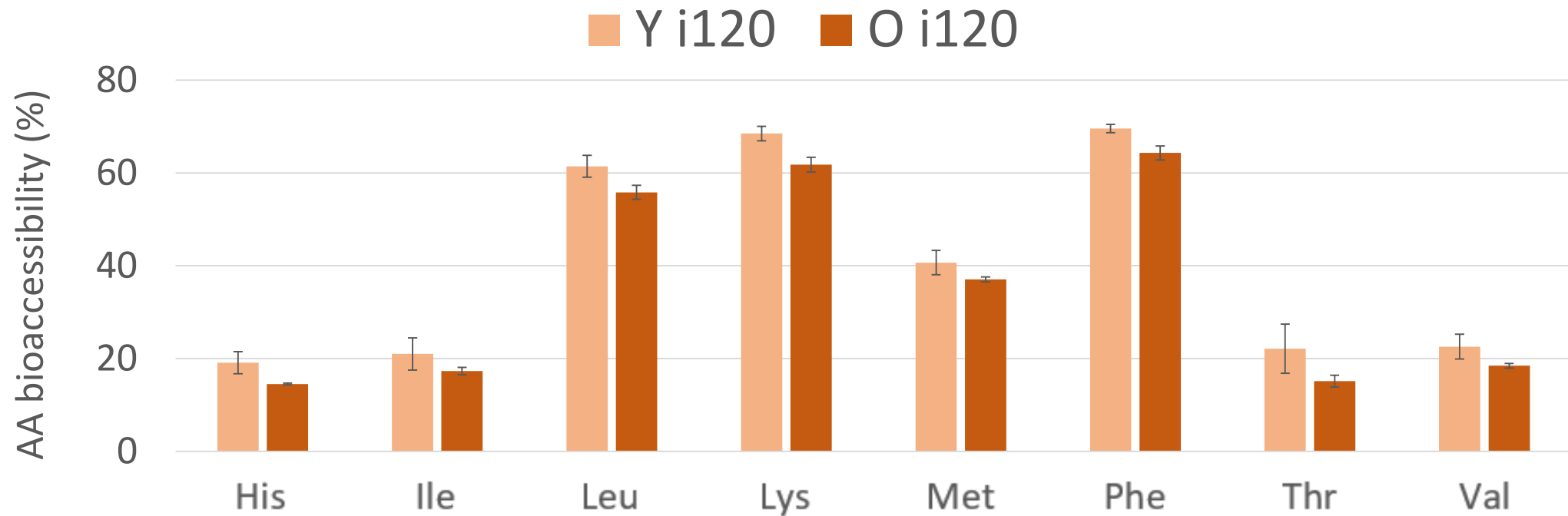
Gastric phase

- DH **old** < DH **young** during the whole gastric phase (-20%) due to the reduction in pepsin activity

Intestinal phase

- Most of proteolysis occurred within the 1st min of intestinal digestion: from approx. 10% to 60-65% DH in 5 min
- High DH values reached at the end of the digestion: **75-85%** in both conditions

➤ Results – Essential amino acids bioaccessibility



- Slightly less essential free AA with the older adult model: **-14%** overall, and **-10%** Leu at the end of the digestion (i120).

➤ Conclusions & Perspectives

- Overall, proteins from SKYR are easily and efficiently digested *in vitro* in both conditions.
- Structure & composition of dairy products may also influence their digestion (mechanical properties, whey protein: caseins ratio, etc.)
- A clinical study comparing the effect of SKYR on young and older adults' postprandial muscle synthesis is underway.

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***In vitro* digestion of two protein-rich dairy products in the ageing gastrointestinal tract†**

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WFF flagship event
20 October 2023

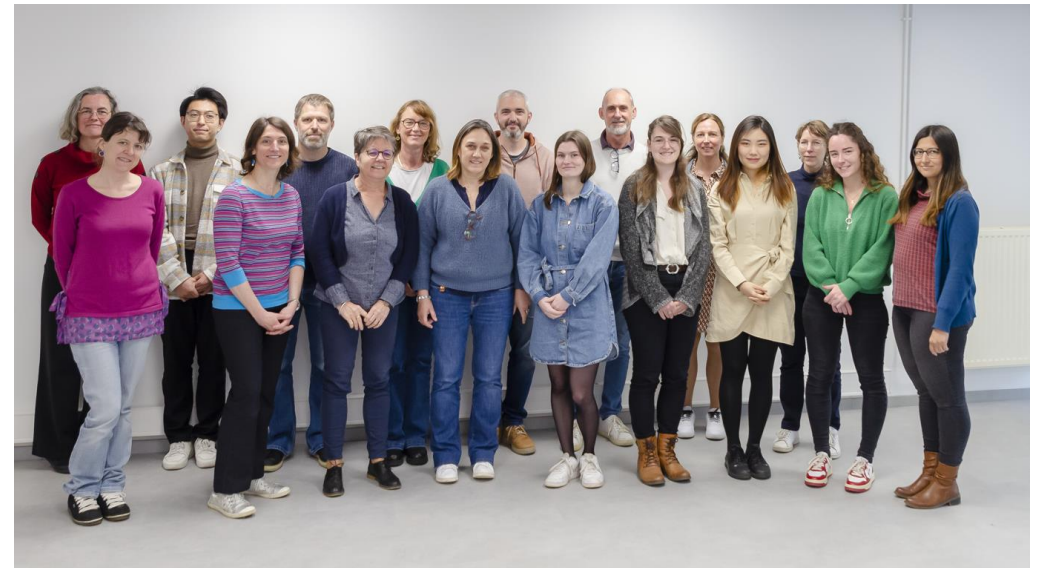
➤ Thank you



EAT4age
Palatable, nutritious and digestible foods for prevention of
undernutrition in active aging



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Bioactivity and Nutrition (BN) team



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