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

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Digestibility interest of dairy proteins

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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

Hoffman & Falvo, J. Sports Sci. Med., 2004, 3, 118–130
Lacroix et al., Am. J. Clin. Nutr., 2006, 84, 1070–1079

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

Volkert et al., Clin. Nutr., 2019, 38, 10–47
Lee et al., Crit. Rev. Food Sci. Nutr., 2021, 1–18

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

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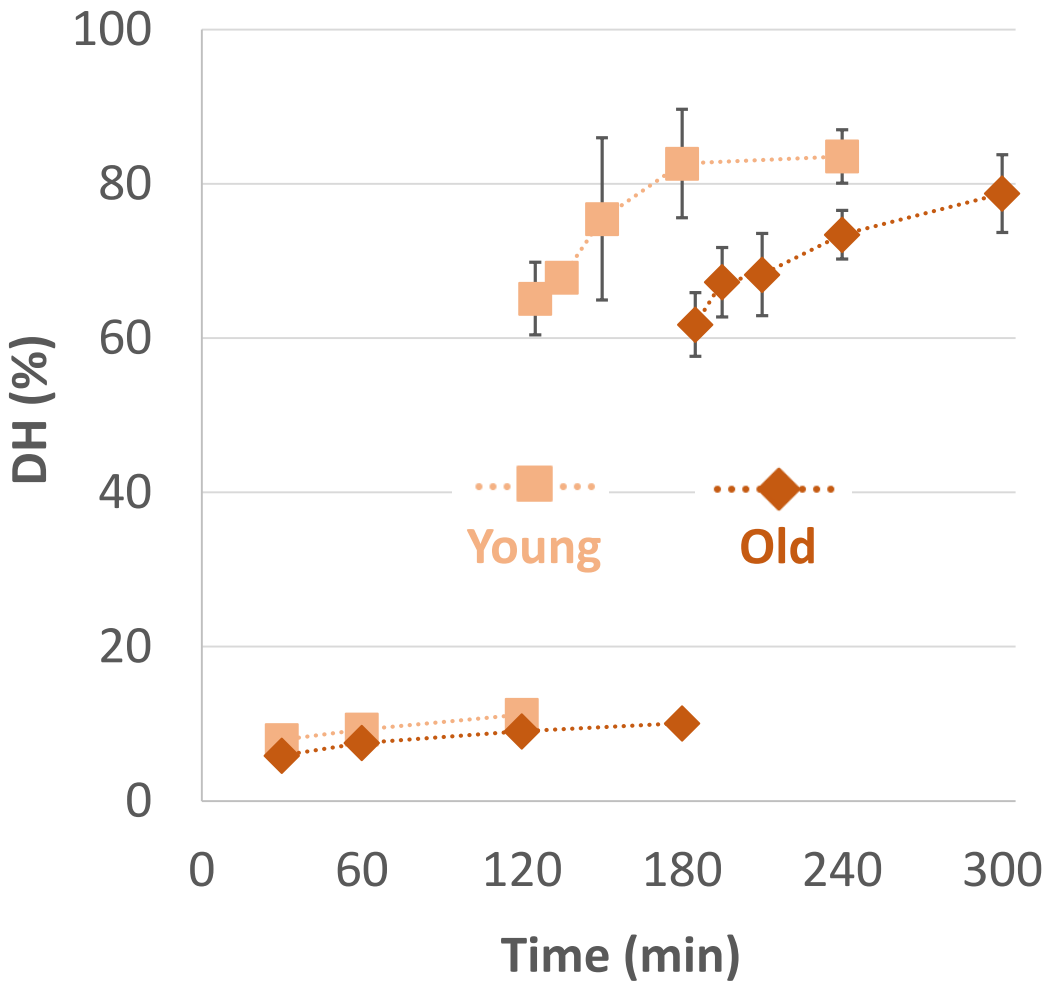
Results: *Degree of hydrolysis (DH)*



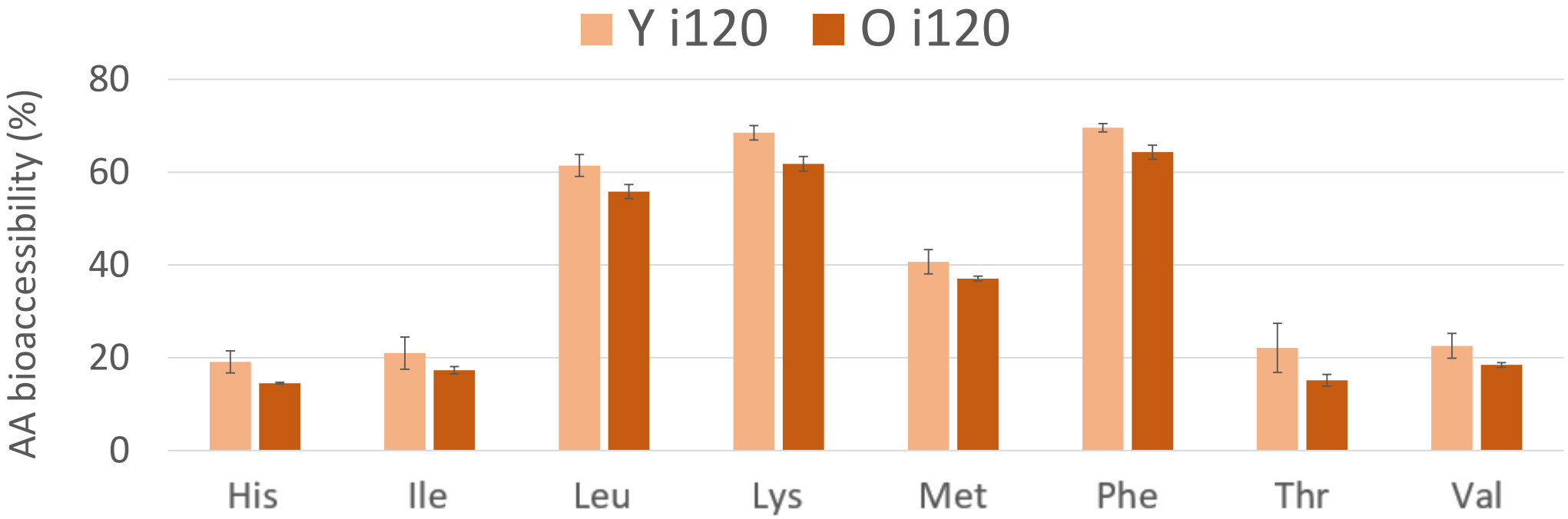
Gastric phase

- 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.

Thank you

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