



HAL
open science

Understanding how the structure of dairy matrices affects protein hydrolysis in the gastrointestinal tract

Florence Barbe, Didier Remond, Yann Le Gouar, Olivia Ménard, Isabelle Souchon, Steven Le Feunteun, Béatrice Laroche, Didier Dupont

► To cite this version:

Florence Barbe, Didier Remond, Yann Le Gouar, Olivia Ménard, Isabelle Souchon, et al.. Understanding how the structure of dairy matrices affects protein hydrolysis in the gastrointestinal tract. *Biopolymères' 2010 Matrices alimentaires: Construction, déconstruction, propriétés sensorielles et nutritionnelles*, Institut National de Recherche Agronomique (INRA). UMR Science et Technologie du Lait et de l'Oeuf (1253)., Dec 2010, Le Croisic, France. hal-01195480

HAL Id: hal-01195480

<https://hal.science/hal-01195480v1>

Submitted on 6 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Understanding how the structure of dairy matrices affects protein hydrolysis in the gastrointestinal tract.

F. Barbé ^{a,b}, D. Rémond ^c, Y. Le Gouar ^{a,b}, O. Ménard ^{a,b}, I. Souchon ^d, S. Le Feunteun ^d, B. Laroche ^e, D. Dupont ^{a,b}

^a INRA, UMR1253 STLO, F-35042 Rennes, France

^b AGROCAMPUS OUEST, UMR1253 STLO, F-35042 Rennes, France

^cUMR1019 UNH, F-63122 St Genès Champanelle, France

^d INRA-AgroParisTech, UMR782 GMPA, F-78850 Thiverval-Grignon, France

^e Univ Paris Sud-CNRS-SUPELEC, UMR8506, L2S, F-91192 Gif-sur-Yvette, France

Florence.Barbe@rennes.inra.fr

Objectives

Understanding and modeling the influence of food structure and of food constituents interactions (i.e food matrix) on proteolysis (prediction of peptides profiles):

-2 well-studied milk proteins :
β-lactoglobulin and caseins

-2 technological processes tested:
→ thermal treatment (90°C-10min)
→ acid and rennet gelation



Materials & Methods

5 matrices (composition= 50g proteins/L): liquid vs. gel gelation during 24h at 20°C

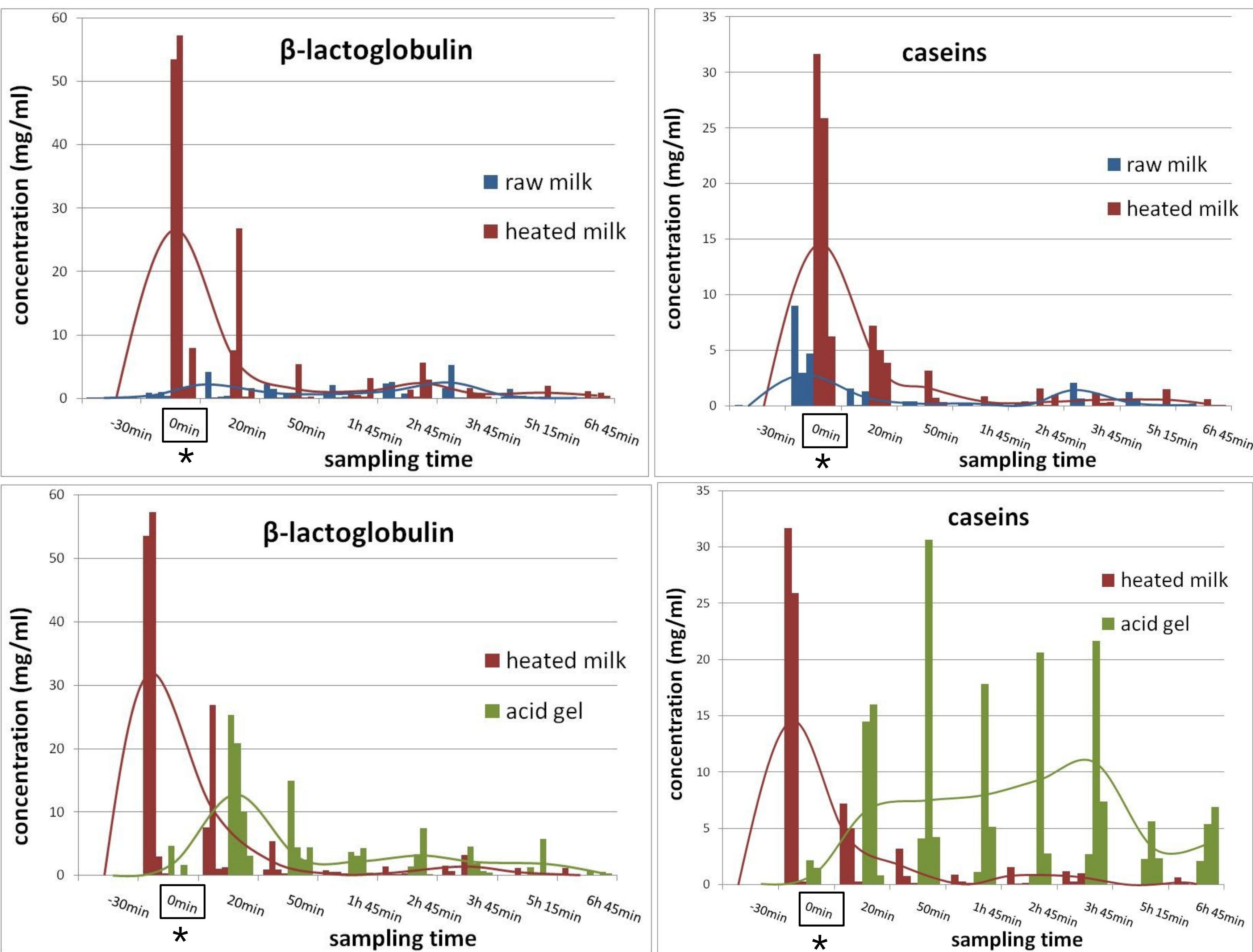
- defatted milk (Ultra Low Heat powder) = raw milk
- defatted milk + rennet = raw rennet gel
- defatted milk + thermal treatment TT 90°C-10min = heated milk
- defatted milk + TT + gluconodeltalactone = acid gel
- defatted milk + TT + rennet = heated rennet gel

6 mini-pigs : 2 T-shaped cannulas
(end of stomach and mid-jejunum)

sampling kinetics: 9 samples until 7 hours after matrix ingestion

analyses: SDS-PAGE and ELISA

Preliminary results (end of stomach) & Discussion



* sampling time at 0 min:
this sampling was simultaneous to matrix ingestion (time of sampling: 2-5 min)

raw milk/heated milk:

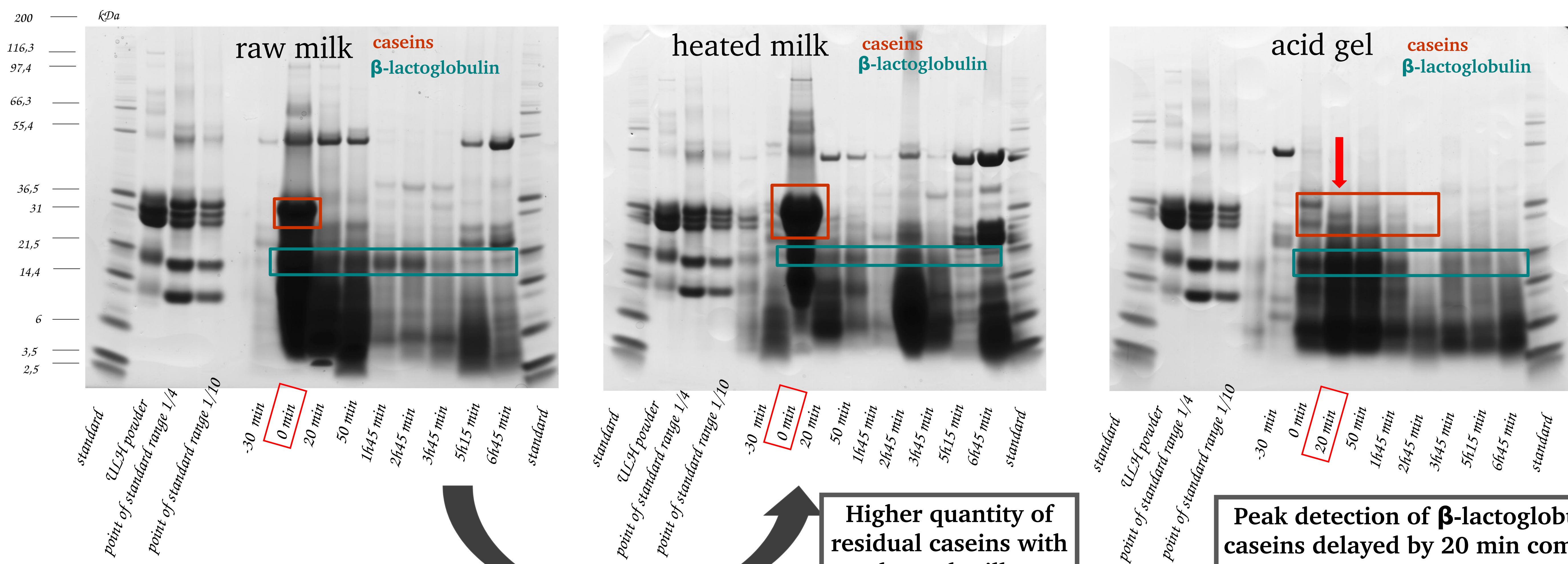
thermal treatment (90°C-10min) → β-lactoglobulin and caseins become resistant to proteolysis until 2h45 min after matrix ingestion

heated milk/acid gel:

acid gelation → the peak of β-lactoglobulin and caseins immunodetection is delayed (20 min) compared to that observed with heated milk

hypothesis:

acid gel ingestion → formation of a denser coagulum in the stomach with slowing down of gastric emptying



ELISA results confirmed by SDS-PAGE

Higher quantity of residual caseins with heated milk

Peak detection of β-lactoglobulin and caseins delayed by 20 min compared to raw and heated milk

Conclusions

These preliminary results show an influence of the food matrix (structure and microstructure) on the kinetics of milk protein digestion *in vivo*.