



HAL
open science

Impact of salivation during milk ingestion on the rheological properties of in vitro gastric contents

Anaïs Lavoisier, Tino Jamme, Florence Rousseau, Martine Morzel

► To cite this version:

Anaïs Lavoisier, Tino Jamme, Florence Rousseau, Martine Morzel. Impact of salivation during milk ingestion on the rheological properties of in vitro gastric contents. IOP Food Physics 2023, Jan 2023, <https://iop.eventsair.com/food-physics-2023/>, France. , 2023. hal-03971998

HAL Id: hal-03971998

<https://hal.inrae.fr/hal-03971998>

Submitted on 3 Feb 2023

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.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

Impact of salivation during dairy products ingestion on the rheological properties of *in vitro* gastric contents

A. Lavoisier, T. Jamme, F. Rousseau, M. Morzel ^a

^aUMR STLO, INRAE, Institut Agro, Rennes, France

Introduction

Context:

- The interindividual variability in saliva flow rate or composition is usually overlooked in digestion studies.
- Results from *in vitro* digestion of cheese suggest that saliva modifies the chyme (i.e., gastric content) physical properties leading to a slight decrease in proteolysis.

Objective:

- Evaluate the impact of saliva incorporation on the rheological properties of *in vitro* gastric contents.

Materials & Methods

Gastric contents



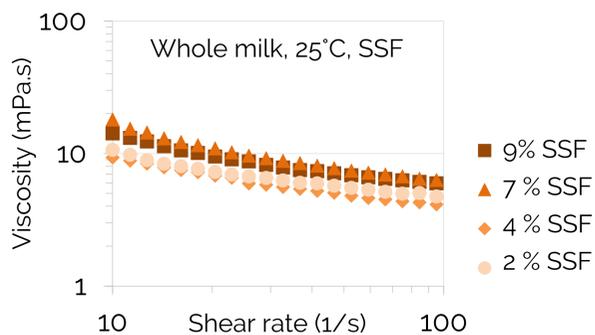
Rheological properties



- Flow test at 25 or 37°C
- Shear rates between 10 and 200 s⁻¹
- 10 min after mixing

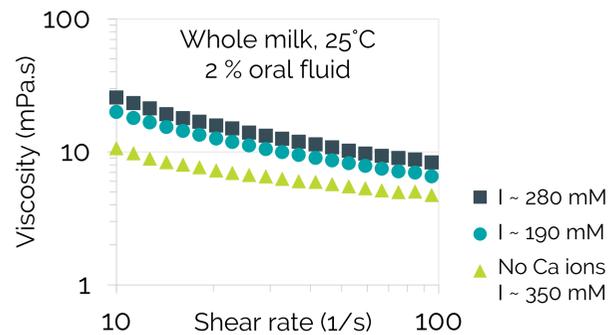
Results

Effect of different levels of oral fluid incorporation



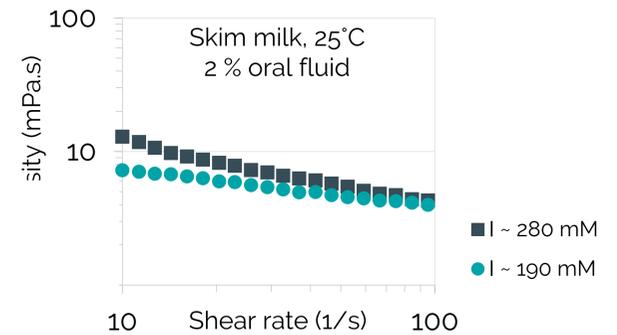
- Chymes containing whole milk were non-Newtonian shear-thinning fluids.
- Unexpectedly, the viscosity of the chyme increased with higher levels of SSF incorporation.

Effect of different ionic strengths/contents



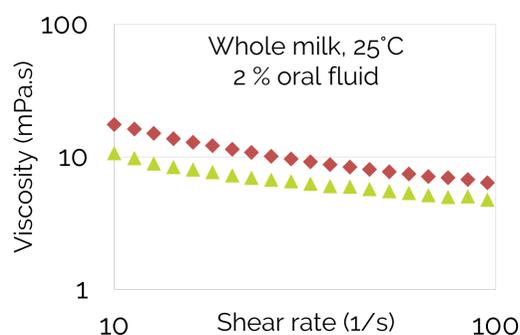
- The viscosity of the chymes increased when increasing the ionic strength of SSF & SGF.
- The absence of calcium ions in SSF & SGF largely reduced the chyme viscosity.

Effect of ionic strength on proteins or fat globules?

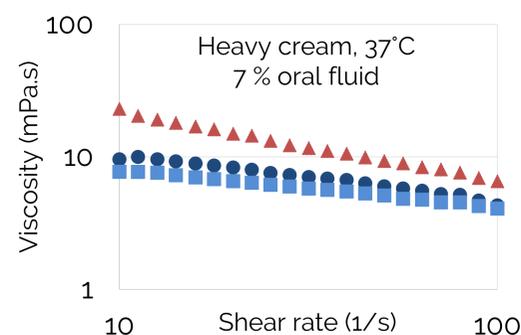


- In skim milk the influence of the ionic strength was comparable to that in whole milk,
- Suggesting that changes in viscosity were not related to the presence of fat globules.

Effect of saliva incorporation on the rheological properties of chymes containing different dairy products



- Viscosity was higher with human saliva compared to SSF
- Probably related to their different rheological properties: human saliva is a viscoelastic fluid while SSF is a Newtonian fluid.



- Again, viscosity was higher with human saliva compared to SSF or water.
- The shear thinning behaviour of the chyme was also more pronounced with saliva.

Conclusions

- The composition of the oral fluid and the incorporation rate influenced the rheological properties of *in vitro* gastric contents.
- The shear viscosity of chymes depended on the rheological properties, ionic strength, and calcium ions content of oral fluids.
- Interindividual variability in saliva flow rate and composition may therefore impact the rheological properties of gastric contents.

References

1. Brodkorb A, et al (2019) INFOGEST static *in vitro* simulation of gastrointestinal food digestion. *Nature Protocols* 14(4) 991-1014.
2. Hunt JN, Stubbs DF (1975) The volume and energy content of meals as determinants of gastric emptying. *The Journal of Physiology* 245: 209-225
3. Humphrey SP, Williamson RT (2001) A review of saliva: Normal composition, flow, and function. *The Journal of Prosthetic Dentistry* 85: 162-169

* Based on the definition of gastric emptying half-time of foods², and on the range of non-pathological salivary flow rates³

