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

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

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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

Whole milk / Skim milk / Heavy cream + SGF (Simulated Gastric Fluid[1])

+ Water / SSF (Simulated Salivary Fluid[1]) / Human saliva ≠ levels of incorporation *

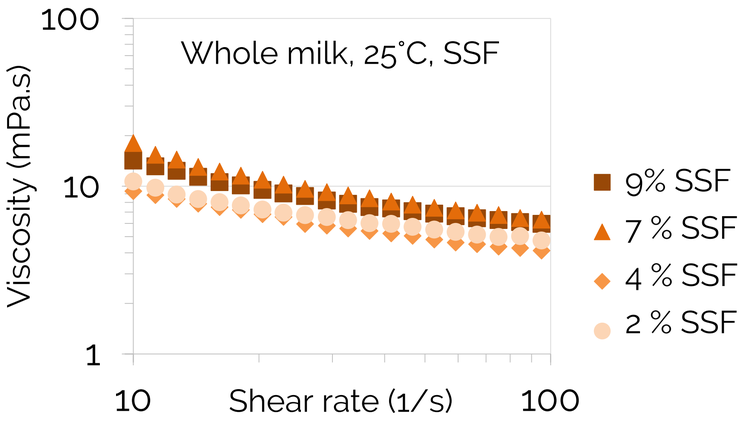
pH 3

Rheological properties

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

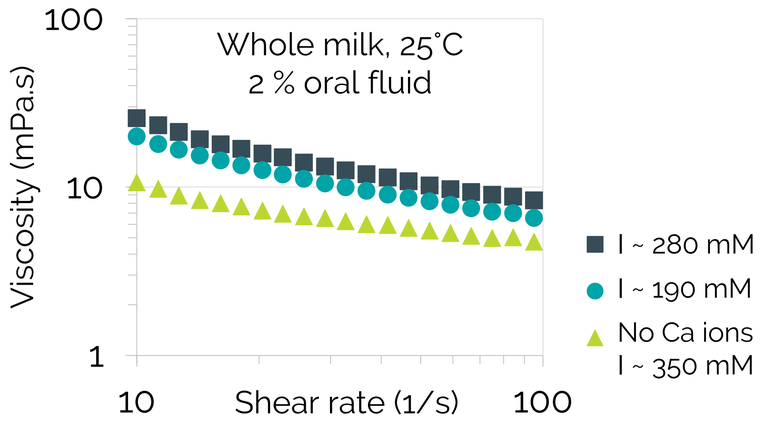
Results

Effect of different levels of oral fluid incorporation



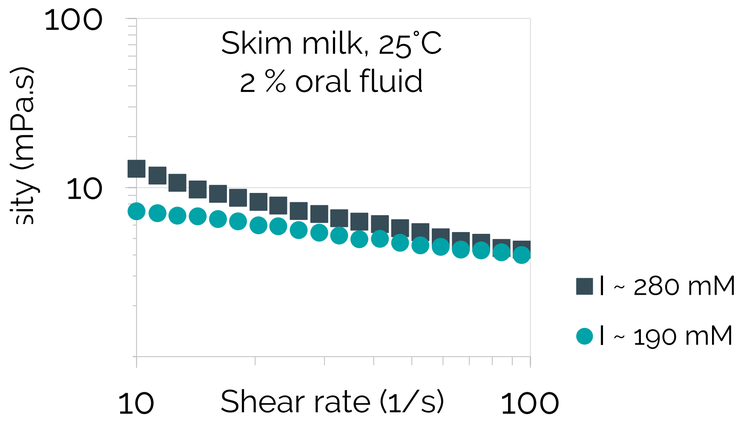
- Chymes containing whole milk were non-Newtonian shear-thinning fluids.
- Unexpectedly, the viscosity of the chyme increased with higher levels of SSF incorporation.

Effect of different ionic strengths/contents



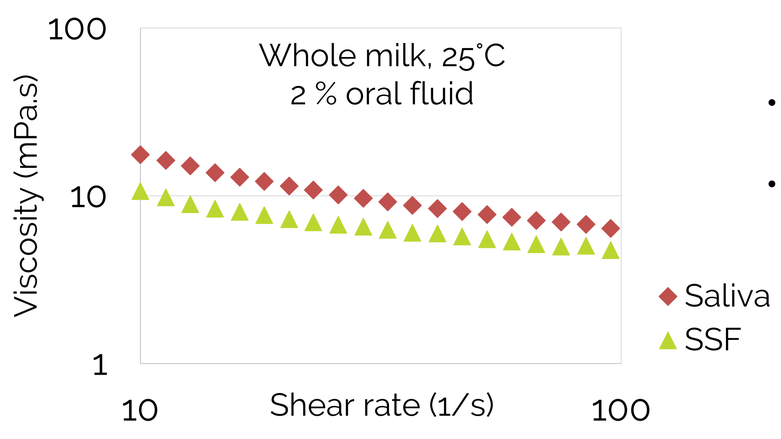
- The viscosity of the chymes increased when increasing the ionic strength of SSF & SGF.
- The absence of calcium ions in SSF & SGF largely reduced the chyme viscosity.

Effect of ionic strength on proteins or fat globules?

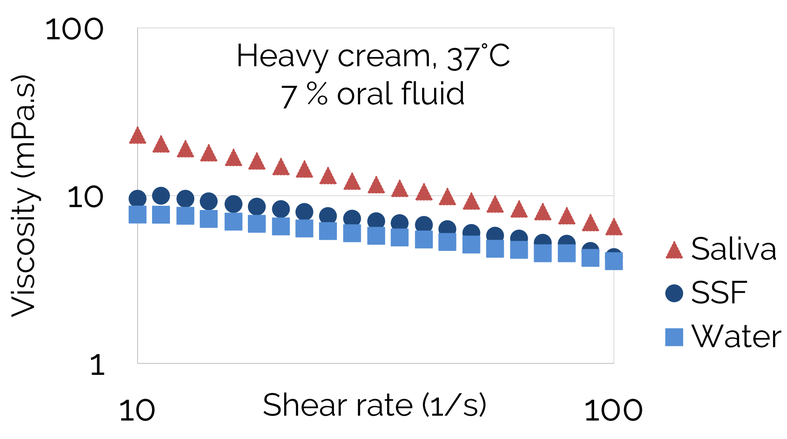


- In skim milk the influence of the ionic strength was comparable to that in whole milk,
- Suggesting that changes in viscosity were not related to the presence of fat globules.

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.

* Based on the definition of gastric emptying half-time of foods[2], and on the range of non-pathological salivary flow rates[3]

References

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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

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