Pepsin diffusivity in whey protein gels and its effect on digestion

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Introduction
Food structures are important in the digestion process. We previously found that the gel structure was hindering the hydrolysis of protein. However, the hindrance is not simply slowing down the hydrolysis, but also altering the enzyme kinetics to some extent (1). We assumed that pepsin can penetrate the gel microstructure and hydrolyze the protein in the gel matrices, and inferred that the diffusion limitation in the gel matrices had led to the difference in hydrolysis kinetics.

Objective
In this research, our aim is to study the diffusivity of pepsin in food microstructure and vice versa, the effect of pepsin diffusion on the microstructure and digestion.

Methods
- WPI gel was used as a model for protein based food matrix
- Fluorescence Correlation Spectroscopy (FCS) was employed to investigate the diffusivity of pepsin in gels
- Size-Exclusion Chromatography (HPSEC) was used to characterize the hydrolysis in the gel digestion
- Scanning Electron Microscopy (SEM) was used to observe the microstructure of the protein gels.

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Conclusions
- Diffusion study and gel composition analysis proved that the digestion process is affected by food microstructure, partly due to the diffusion limitation.
- SEM shows that the surface layer of the protein gel is weakened and consequently "worn-away" during digestion.

Reference