

[O.39]

Study on pepsin diffusion in protein gel digestion

Q. Luo*, R.M. Boom, A.E.M. Janssen
Wageningen University, The Netherlands

Introduction:

Protein is one of the essential macronutrient and its digestion starts in the stomach. Numerous in vitro studies on protein digestion are based on experiments with protein solutions, however the majority of proteins exists in solid food. Therefore, our research is aimed at understanding how the structures of food affects the digestion of protein.

In our previous study, we 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 inferred that the diffusion limitation in the gel matrices had led to the difference in the hydrolysis kinetics. Our current study is aiming at measuring the diffusivity of pepsin in gel matrices.

Methods:

Whey protein gel was used as a model for protein based food matrix. Pepsin was labelled with an Alexa Fluor® dye, its diffusion was measured by Fluorescent Correlation Spectroscopy (FCS). A degree of hydrolysis assay and Size Exclusion Chromatography (HPSEC) were used to characterize the hydrolysis in the gel digestion. Scanning Electron Microscopy (SEM) was used to observe the surface of the protein gels.

Result:

We measured the diffusion coefficients of pepsin in different solutions and gel matrices. Degree of hydrolysis and HPSEC of digested gels indicated the effect of pepsin diffusion on hydrolysis extent. SEM images showed the microstructural change of gel during digestion.

Discussion:

By quantifying the diffusion of pepsin, we gained insight on the action of pepsin in protein digestion. Moreover, this approach makes it possible to bridge the digestion process with established physical-chemistry theories and models, which may lead to better knowledge on the underlying mechanisms of gastric digestion.

Reference:

(1) Luo, Q., Boom, R.M., & Janssen, A.E.M. (2015). *LWT - Food Science and Technology*, 63, 161–168

Keywords: Gastric digestion, Whey protein gel, Pepsin, Fluorescent Correlation Spectroscopy