LABORATORY OF BIOPHYSICS

WAGENINGEN UNIVERSITY & RESEARCH

Topsector Agri& Food

Application of NMR/MRI markers to gastric milk protein digestion

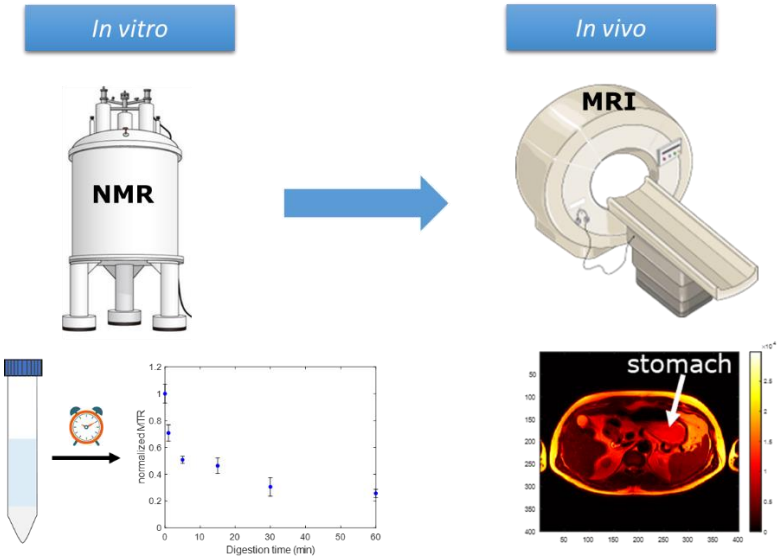
Industrial preparation of infant formulas includes processing steps, such as heat treatment, which can lead to protein modifications and hence impact the overall protein digestibility. Furthermore, other components present in the product matrix, including lipids and carbohydrates, may influence these modifications. Understanding the effect of heating and food matrix components on protein digestion can inform the development of processing approaches for industry that optimize digestibility of the proteins. Protein digestion in the gastro-intestinal tract is typically studied using static or dynamic *in vitro* digestion models mimicking either adult or infant digestion.

Although, *in vitro* models are a useful tool for investigating digestion, verifying *in vitro* findings *in vivo*, especially in humans, remains a big challenge. Magnetic Resonance Imaging (MRI) techniques have the potential to monitor gastric digestion of proteins in a non-invasive manner and, hence, can be used to bridge the gap between *in vitro* digestion models and real-life digestion processes.

In this collaboration project between the Laboratory of Biophysics (BIP) and Human Nutrition and Health (HNH), we aim at developing MRI markers that enable monitoring of *in vivo* gastric protein digestion. As candidate MRI markers **magnetization transfer (MT)**, **chemical exchange saturation transfer (CEST)** and **relaxation time dispersion ($T_{1\rho}$ and T_2)** are considered for studying milk protein coagulation and digestion. First, the MRI markers will be developed on an NMR spectrometer and will be validated for studying protein digestion using an *in vitro* infant digestion model. Once, the markers have been validated, they will be implemented on an MRI scanner to ultimately study *in vivo* gastric protein digestion.

BSc/MSc thesis projects

1. Development and validation of T_2 dispersion NMR for monitoring *in vitro* protein digestion kinetics
2. Programming a $T_{1\rho}$ and/or CEST pulse sequence and exploring their potential for monitoring *in vitro and vivo* protein digestion



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