Title:

An *in silico* model to study the impact of the age-related weakening of masticatory and gastric functions on meat digestibility.

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Abstract:

Proteins digestion speed is the main factor influencing their assimilation by the body. Accelerating it thus contributes to a sufficient absorption of the essential amino acids present in the meat, and can therefore participate in the dietary strategy, particularly for elderly people prone to the risk of sarcopenia and refractory to an increased intake. However, digestion speed depends on many factors, especially in the stomach of its ability to regain an optimal acidic pH quickly after ingestion of the bolus, movement and viscosity of the gastric fluid, pepsin secretion, food type and bolus particles size post-chewing.

Most data on the gastric digestibility of meat come from experimental studies conducted *in vitro* or *in vivo* in humans or animals. The *in vivo* measurements give a global indication of the effects of the different factors on the digestibility whereas the experiments carried out *in vitro* are limited in the representation of the human physiology. Mathematical modeling offers an alternative approach that can provide information that is long or sometimes impossible to obtain experimentally.

A model has been achieved that combines the kinetics of protein degradation by pepsin obtained *in vitro* with the laws of diffusion of pepsin and protons within the food particles and takes into account the buffering capacity of meat. This *in silico* model has been applied to young and older adults' physiological data to simulate the effect of a degradation of their masticatory capacities or gastric physiology on the digestibility of proteins in the stomach.

The results unsurprisingly show that the digestion of meat proteins, very effective for the young adult, can strongly decrease when the masticatory function, gastric acidity or gastric mobility decline. The model is able to quantify the different factors' effect on the rate of gastric digestion of meat proteins.

Key words: diffusion, digestion, kinetics, meat, model, pepsin