

Harmonized *in vitro* digestion and Ussing chamber to investigate the effects of polyphenols on the intestinal physiology.

The properties of several nutritional compounds depend on the digestion process. Plant polyphenols are an example, given that their physiological effects, bio-accessibility, and bioactivity can vary depending on the intestinal pH, interaction with other nutrients, gut microbiota composition, and several other factors.

Because of the dynamic processes involving complex enzymatic and physiological events that take place in different gastro-intestinal segments, the use of a single model to reproduce *in vitro* the digestion and the absorption of nutrients is difficult to simulate.

In-vitro digestion (IVD) protocols are widely used to address questions in the field of nutritional research. However, the biological relevance of the IVD protocols needs to be validated for each research question and several protocols exist, making a comparison between studies difficult.

The *in-vitro* simulation of the complex intestinal absorption is also challenging. Peristaltic movements are strictly associated with the gut functions by mixing and separating the lumen content. Additionally, the intestine hosts commensal microbial communities responsible for the intestinal homeostasis and immune system maturation.

The improvement of *in-vitro* models implemented to better represent the physiological conditions represents a big challenge for scientists. This intervention aims to describe the combination of a harmonized *in vitro* digestion method (INFOGEST), coupled with the Ussing perfusion chambers as a valuable model for the digestion and subsequent absorption of nutrients or bioactives in monogastrics and ruminants, with special emphasis on phenolic compounds.