In vitro digestibility testing – INFOGEST

Improving health properties of food by sharing our knowledge on the digestive process

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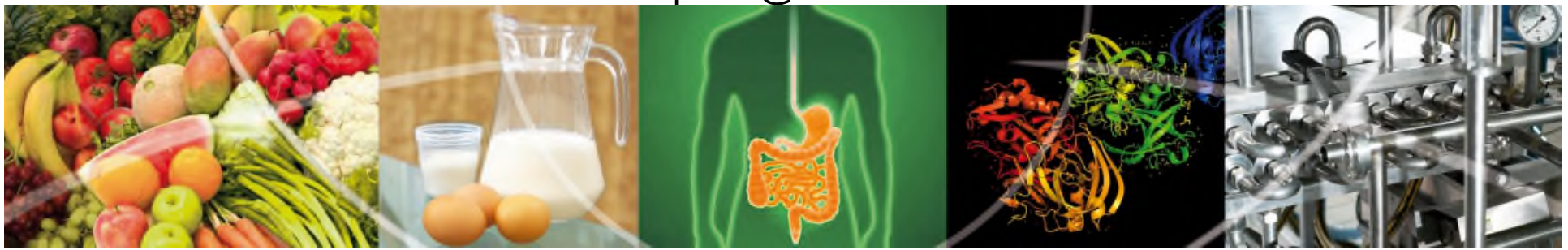


INFOGEST

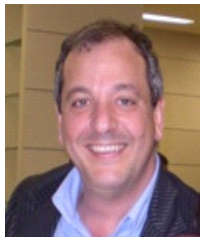
Chair
Didier Dupont - France

Vice-chair
Alan Mackie - UK

Characterization of raw materials and processed food matrices for optimized nutrient bioaccessibility
WG1

BFC identification
Stability during processing
Food multi-scale characterization

B. Murray
UK

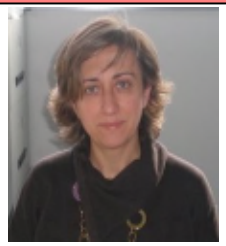


F Capozzi
Italy

***In vitro*, *in vivo* and *in silico* models of mammalian gastrointestinal digestion**
WG2

Digestion models harmonization
Comparison *in vitro* / *in vivo*
Digestion products identification
BFC absorption /bioavailability

A. Brodkorb
Ireland



I. Recio
Spain

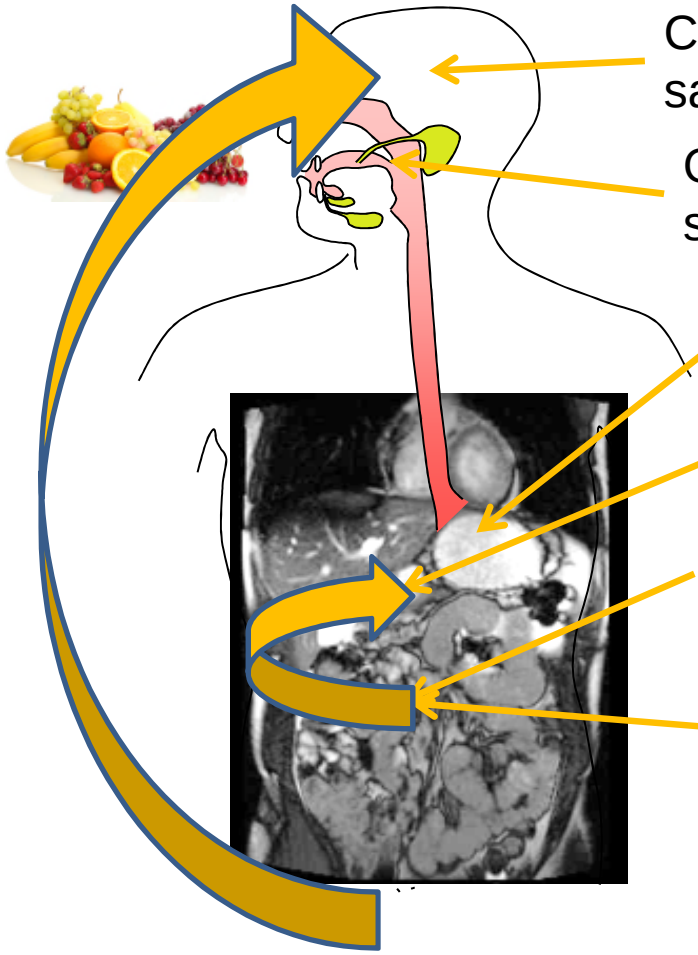
Evaluation of the health effects
WG3

Immunomodulatory properties
Regulation of appetite and satiety
Effect of BFC on human microbiota

A. Bordoni
Italy

Tor Lea
Norway

Food Structure and Nutrient Release



Cognitive and sensory enhancement of satiety and enzyme secretion

Oral processing: aroma, taste and texture sensing starch hydrolysis and chewing

gastric processing: proteolysis, lipolysis, acidification and storage -> fullness

gastric processing: shearing, grinding

intestinal processing: proteolysis, lipolysis, amylolysis, mixing and absorption

intestinal processing: nutrient sensing, hormone secretion

hormone secretion: controlling GI motility, enzyme and bile secretion, appetite

The objective for Infogest

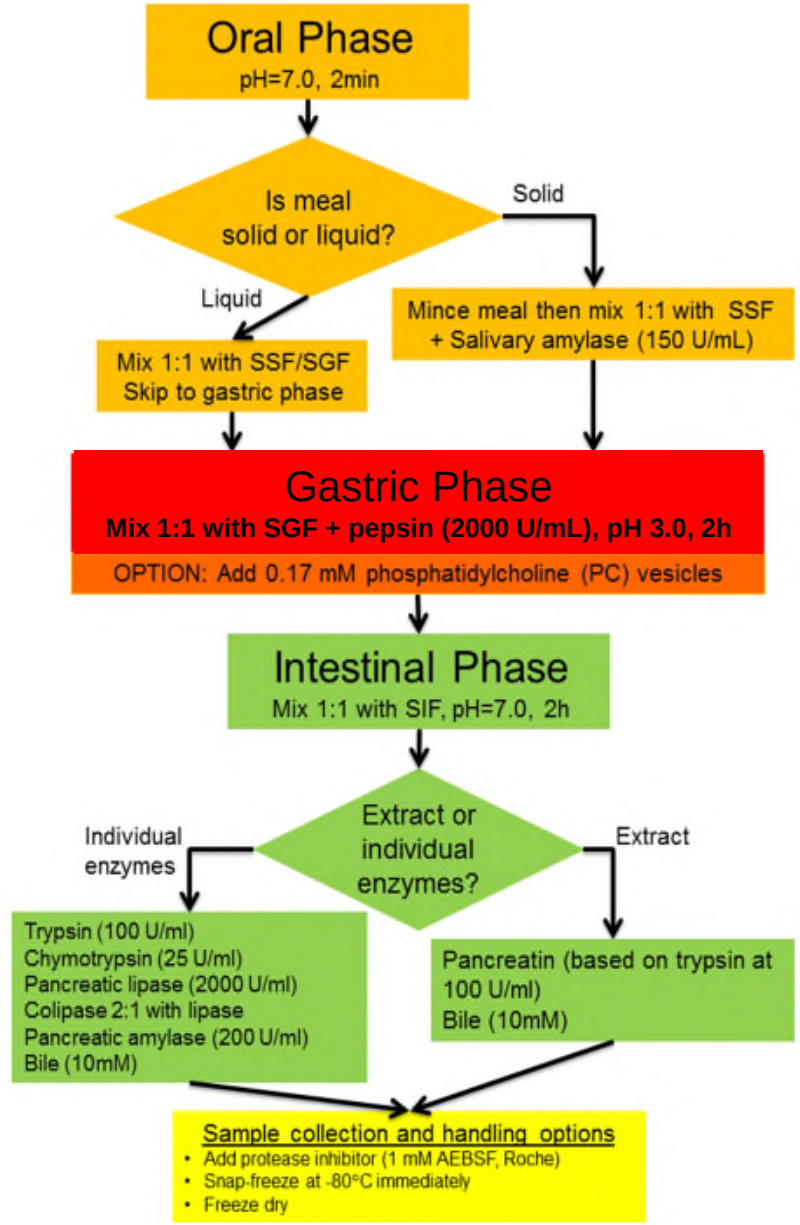
To produce a protocol to simulate human digestion that was:

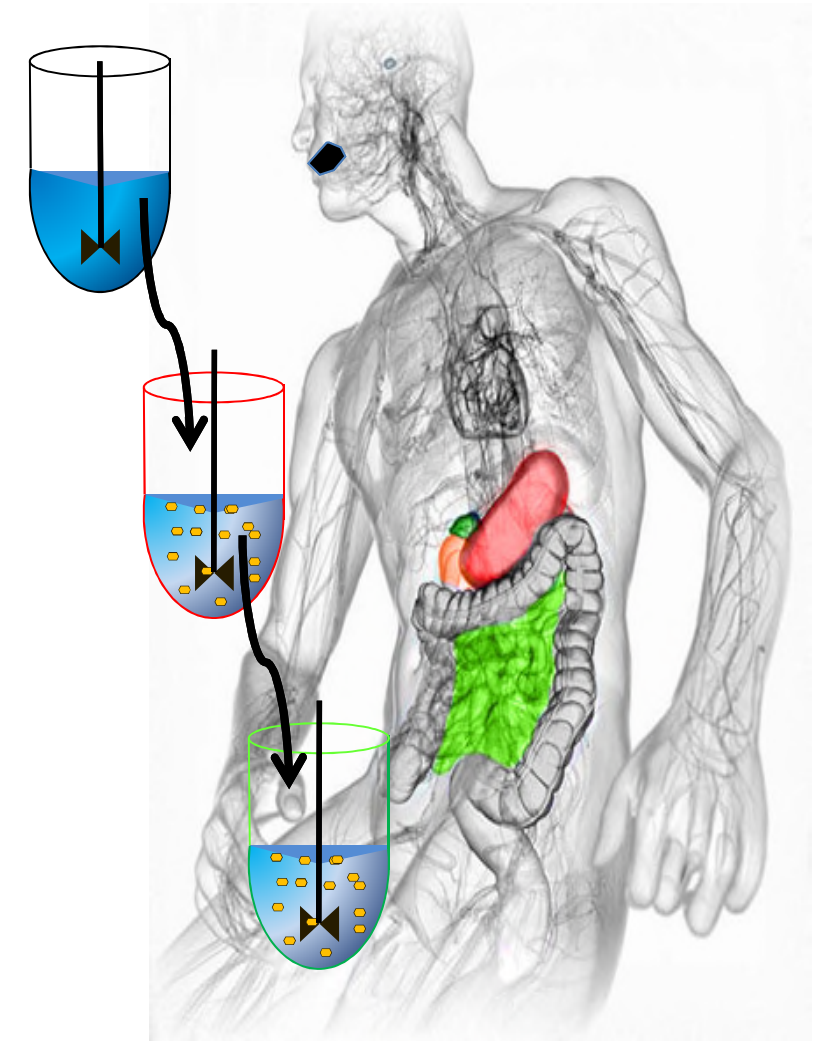
- "Simple" and could be used in any laboratory
- Based on human physiology

Giving results that are:

- Reproducible
- Consistent with human data on the same samples

The PROCEDURE





Dissemination

Minekus, M., et al. (2014). A standardised static in-vitro digestion method suitable for food – an international consensus. *Food and Function, 5*, 1113-1124.

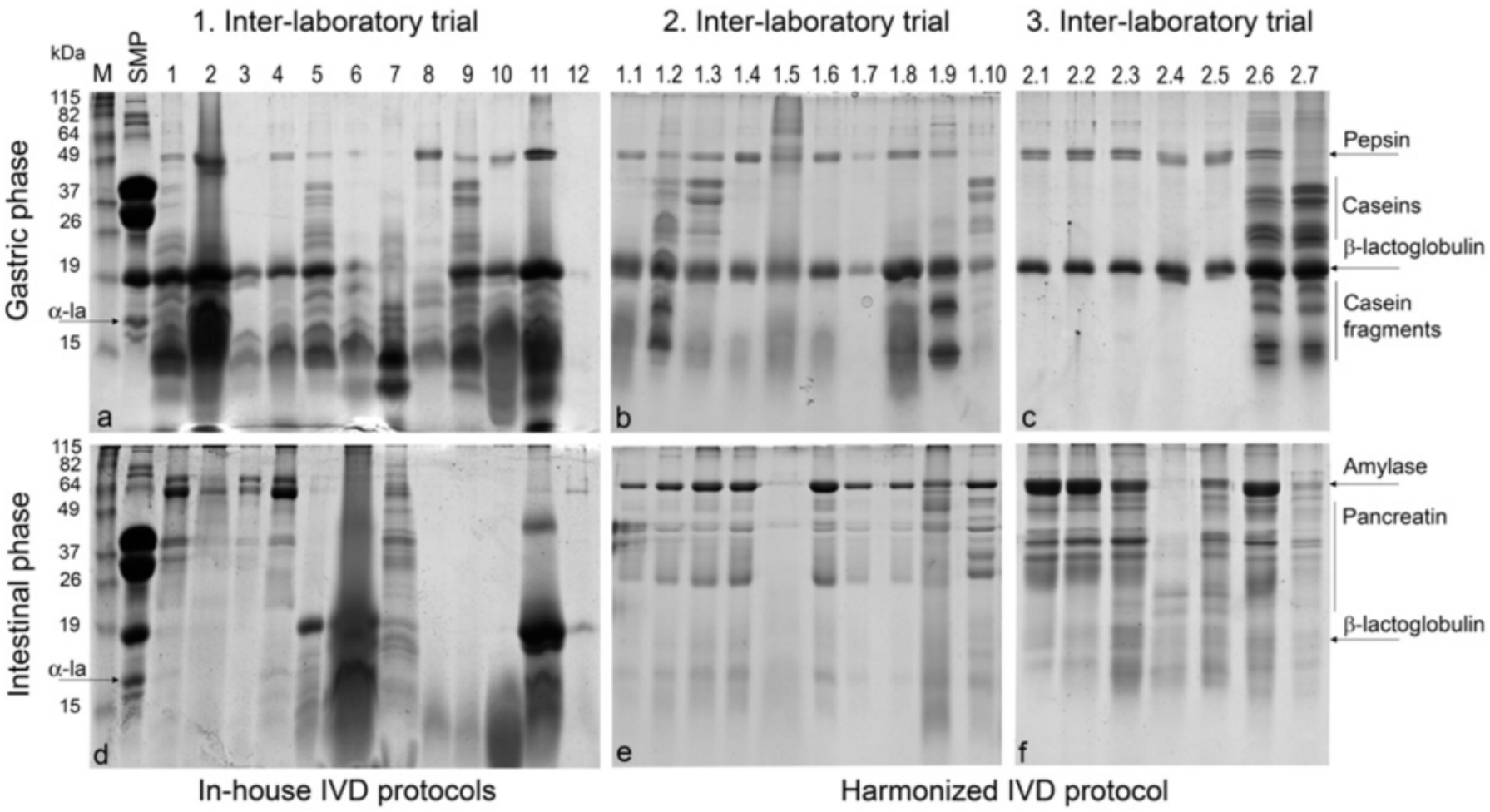
Egger, L., et al. (2016). The harmonized INFOGEST in vitro digestion method: From knowledge to action. *Food Research International, 88, Part B*, 217-225.

Mackie, A. R., & Rigby, N. M. (2015). Infogest Concensus Method. In K. Verhoeckx, P. Cotter, I. López-Expósito, C. Kleiveland, T. Lea, A. R. Mackie, T. Requena, D. Swiatecka & H. J. Wichers (Eds.), *The Impact of Food Bioactives on Health In Vitro and Ex Vivo Models*: Springer.

Youtube*: https://www.youtube.com/channel/UCdc-NPx9kTDGyH_kZCgpQWg*

Dropbox folder:
https://www.dropbox.com/sh/kjjv365egc1be11/AAC5tJUYFWxnnJKyMokvzTYwa?dl=0

Harmonisation

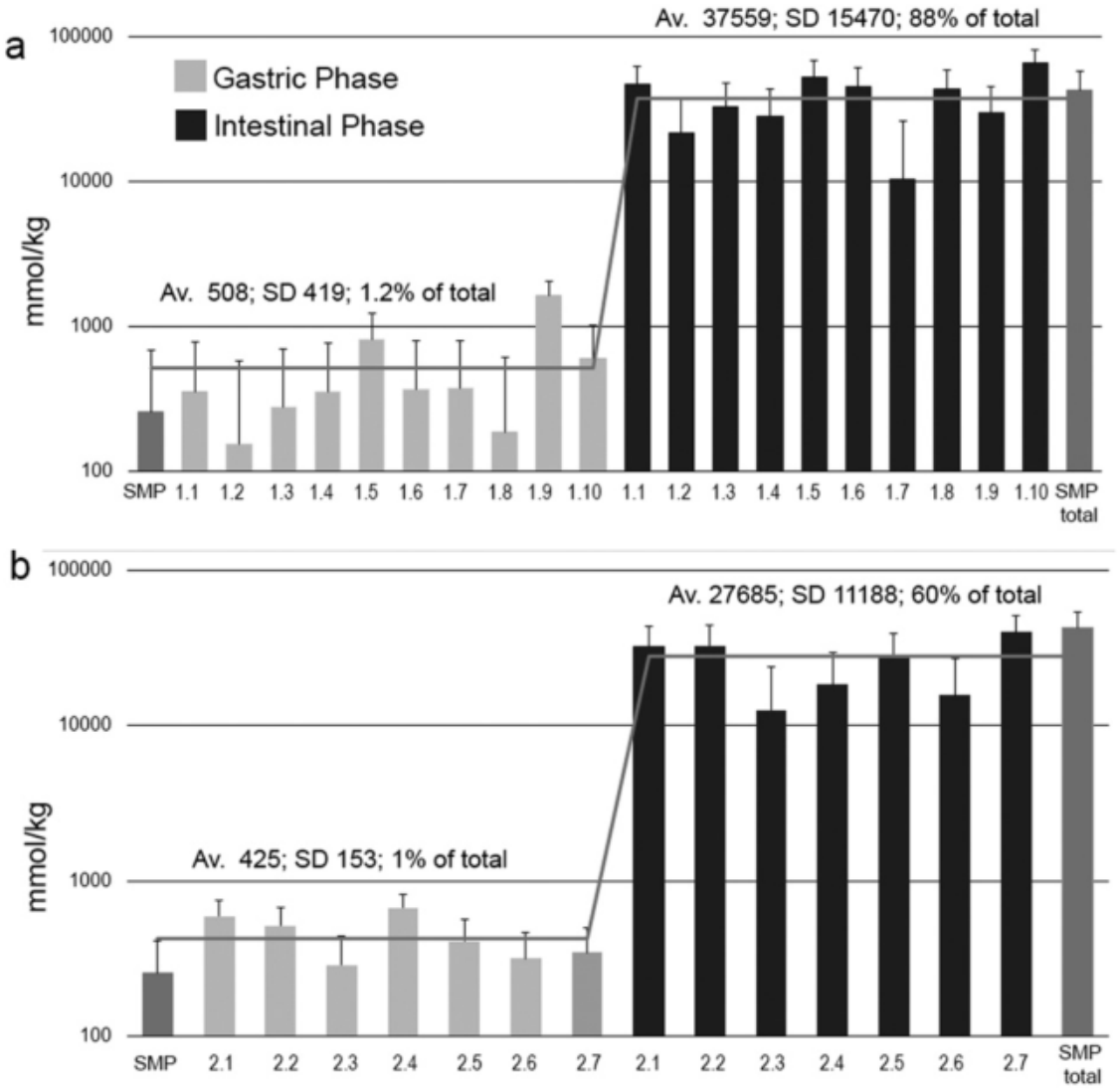


Digestion of skimmed milk powder (SMP)

Harmonisation

Release of free amino acids from SMP after gastric and intestinal phases of *in vitro* digestion.

HPLC analysis of samples from inter-laboratory trials applying the harmonized protocol



Pros and cons

Pros:

- Simple to use
- Has been used in different labs giving the same results
- The end points seem the same as *in vivo* (SMP in pigs)

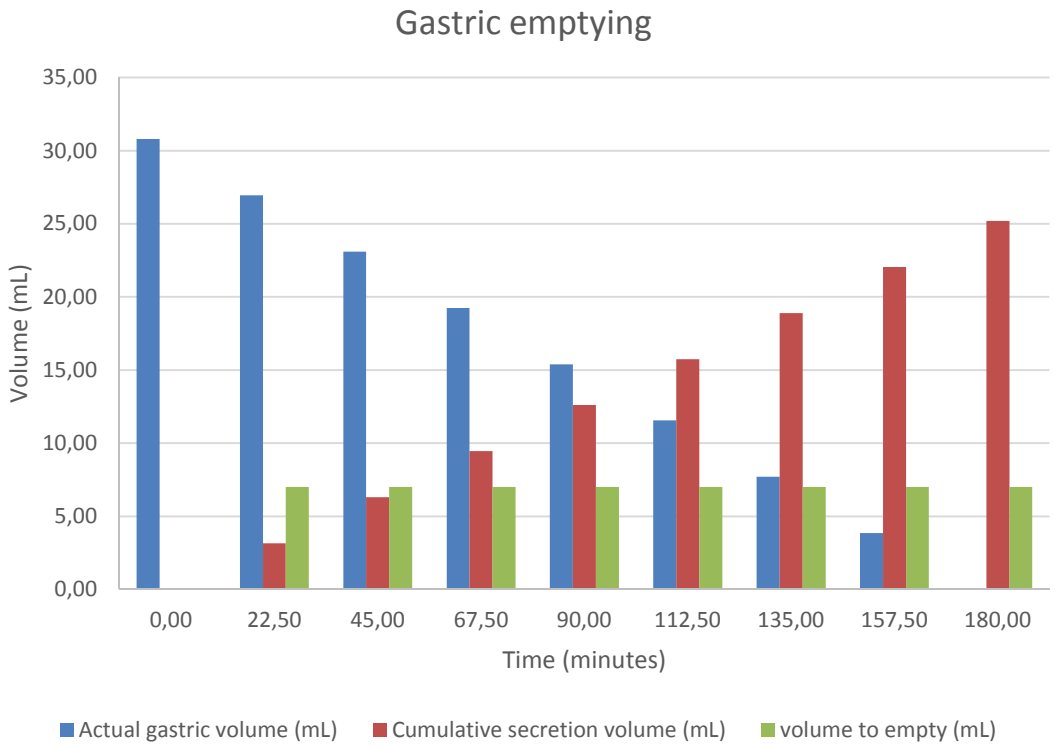
Cons:

- Cannot be used for kinetics
- Only mimics adult conditions
- No gastric lipase included

Updates

- Semi-dynamic
  - Dilution in the oral phase to be based on dry weight
  - Inclusion of gastric emptying (based on caloric density), gradual secretion of simulated gastric fluid including acid and enzymes, inclusion of “gastric lipase”
- Infant conditions
  - tba
- Elderly conditions
  - tba

Semi-dynamic



- A 500mL meal is assumed for calculating the emptying rate.
- volumes are then scaled based on a smaller experimental sample (in this case 20g of food).
- The caloric density (0.72) gives 360 calories to empty @ 2 kcal/min = 180 mins
- Gastric secretion occurs over the same time.

Semi-dynamic

- Assuming 20g of food with a dry weight of 8g, the oral phase volume = 20+8 = 28g
- The final volume of gastric secretion = 28g, 10% is put in at the start
- Gastric lipase(rabbit) is included at 50 U/mL
- Intestinal digestion is in parallel. In this case 7g is emptied and diluted with 7g of simulated intestinal fluid

Pros and cons

Pros:

- More physiological simulation of the gastric phase
- Can be used to assess kinetics
- Still based on small volumes and simple apparatus
- Can be used in many labs

Cons:

- More complicated procedure
- The emptying may be difficult with some foods (solids)
- Sourcing a suitable gastric lipase