The 5th International Conference on Food Digestion . Introduction

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1. Introduction to the Special Issue

Unravelling the fate of food in the gastrointestinal tract is essential to better understand the health effects of the food and to fight against diet-related pathologies such as cardiovascular diseases and type-2 diabetes. Digestion is the process that transforms food into nutrients. The first step of digestion occurs in the mouth, where mastication transforms solid and semi-solid foods into particles while mixing with saliva allows bolus formation and initiates digestion of carbohydrates. Then the bolus is transferred into the stomach, where acid conditions and specific enzymes (pepsin, gastric lipase) start hydrolyzing macronutrients like proteins and triglycerides. The next step occurs in the small intestine, where other digestive enzymes further degrade macronutrients allowing their absorption. In the small intestine, proteins are hydrolyzed by trypsin, chymotrypsin, elastase, carboxypeptidase etc, lipids by pancreatic lipases, and carbohydrates by pancreatic amylase. Small intestinal digestion is completed by the enzymes of the brush border membrane that release macronutrients, which can be absorbed by enterocytes to reach the bloodstream. Undigested material, fiber for example, reaches the large intestine where it is further metabolized by the intestinal microbiota.

Investigating food digestion requires the use of models and a myriad of *in vitro* (static and dynamic), animal and human models have been described in the literature with the objectives of understanding the fate of food in the gastrointestinal tract. In particular, static *in vitro* digestion simulations are extremely popular because they are very easy to use and do not require sophisticated equipment. They have been shown to be adapted for screening large series of similar samples in identical conditions or to understand interactions at the molecular scale (Bohn et al., 2017). However, they are too simple to study more complex phenomena and the kinetics of food digestion for which dynamic *in vitro* models are more appropriate (Dupont et al., 2018).

There was a high heterogeneity between the different static *in vitro* digestion models that were used by the research groups all around the world. Models were differing in the pH used in the different phases (gastric and intestinal), their duration, the digestive enzyme/substrate ratio, etc For that reason, comparing results obtained from one study to another was impossible and there was a crucial need for a harmonized method that could be used by everyone allowing comparison between studies. This was one of the main objectives of the INFOGEST COST Action.

2. INFOGEST: an international network of excellence on the fate of food in the gastrointestinal tract

INFOGEST (www.cost-infogest.eu) was a former COST Action FA1005 (2011-2015) whose objective was “to improve health properties of food by sharing the knowledge on the digestive process”. Since 2016, it has become an international network that now gathers more than 400 scientists from 140 institutes in 41 countries in Europe but also USA, Canada, Argentina, Australia, New Zealand, etc (Fig. 1).

The network is chaired by Didier Dupont (INRA, France), co-chaired by Alan Mackie (University of Leeds, UK) and organized into 6 Working Groups (Fig. 2):

- WG1: *In vitro/in vivo* correlations
- WG2: *In vitro* semi-dynamic model of digestion
- WG3: Models for specific populations (infant, elderly…)
- WG4: Digestive lipases and lipid digestion
- WG5: Digestive amylase and starch digestion
- WG6: *In silico* models of digestion

INFOGEST has allowed the harmonization of the methodologies used to study digestion and proposed guidelines for performing new experiments. One of the major outcomes of the Action was the release of a consensus model of *in vitro* digestion (Minekus et al., 2014) that has been cited more than 480 times and is now used all around the world and can be learned through videos available on a YouTube channel specifically created for the Action with more than 16000 views since its creation (https://www.youtube.com/channel/UCdc-NPx9kTDGyH_kZCgpQWg). The open access book “The Impact of Food Bioactives on Health” (INFOGEST *et al.* 2015) was also released in 2015 and, so far, has a total of 470000 chapter downloads (https://link.springer.com/book/10.1007/978-3-319-16104-4). Beside an increased knowledge on the digestive process that is now shared among all the participants, the other outcomes were the validation of *in vitro* models towards *in vivo* data (Egger et al., 2017; Sanchon et al., 2018), the identification of bioactives released in the gut during digestion (Guven, Sensoy, Senyuva, & Karakaya, 2018; Takacs et al., 2018), the demonstration of the impact of food structure on its disintegration in the gut and the bioaccessibility of food nutrients and bioactives (Mat, Le Feunteun, Michon, & Souchon, 2016; Mulet-Cabero, Rigby, Brodkorb, & Mackie, 2017) and a better knowledge on the relationship between food and human health (Prodic et al., 2018).

INFOGEST created the International Conference of Food Digestion (5 meetings between 2012 and 2017) that is now regularly followed by more than 200 scientists (Fig. 3). The 5th International Conference of Food Digestion was held on the 4-6 of April 2017 in Rennes, France and gathered 234 scientists from 28 countries (Europe, Argentina, Australia, Brazil, Canada, China, Japan, Mexico, New-Zealand, Singapore and USA).

The topics discussed in Rennes were:

- Food structures and nutrient bioaccessibility/bioavailability

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Fig. 1. The INFOGEST international network.

Fig. 2. The INFOGEST Working Groups.

- Design and characterization of functional food
- Oral processing and sensory properties of food
- *In vitro*, *in vivo* and *in silico* models of digestion
- Unravelling the mechanisms of food digestion
- Effect of food on gut microbiota and, more broadly, on human health

After the conference, original articles were submitted by the delegates to Food Research International for publication and 13 publications have been accepted for a Special issue in this journal. Finally, the guest editors would like to thank Elsevier staff for all the editorial help they provided and especially like to thank Prof. Anderson Sant'Ana, Editor-in-Chief for help and encouragement.

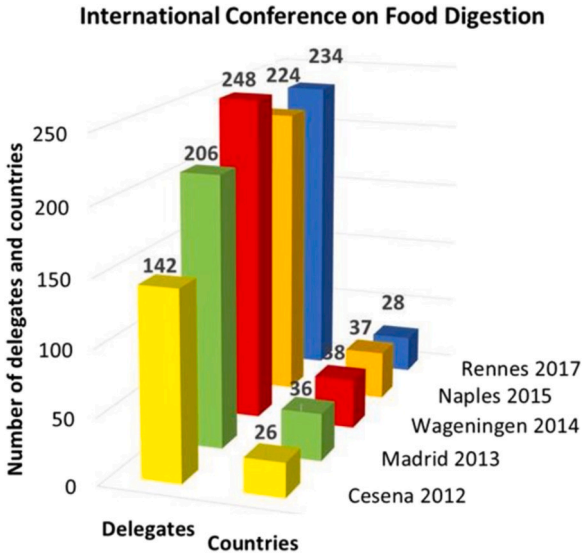

Fig. 3. Number of delegates and participating countries to the different issues of the International Conference of Food Digestion.

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