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

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COST

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

FA1005

Start date: 01/06/2011

End date: 31/05/2015

Year: 2

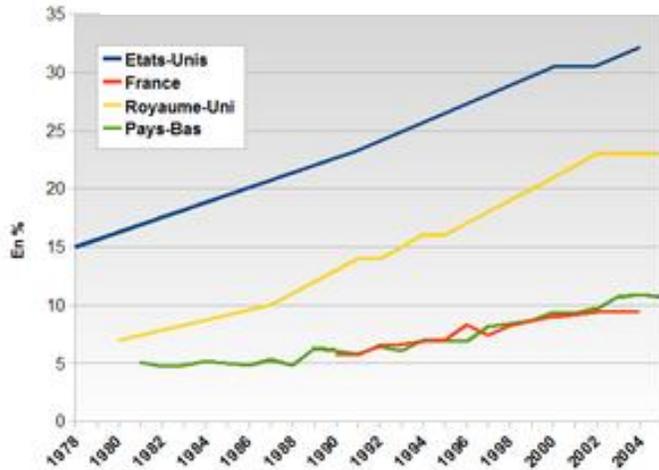
Didier DUPONT

Chair

INRA/ FRANCE

INFOGEST

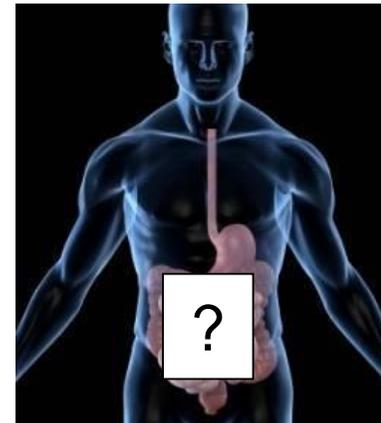
Scientific context and objectives (1/2)



Diet-related diseases ↑

↙ Prevent these pathologies rather than cure them

Gut = interface between food and human body
Digestion releases food components that can have a beneficial or a deleterious effect on human health



Need to increase our knowledge on the effect of food on human health by increasing our knowledge on food digestion

Scientific context and objectives (2/2)

- Compare the existing digestion models, harmonize the methodologies and propose guidelines for performing experiments
- Validate *in vitro* models towards *in vivo* data (animal and/or human)
- Identify the beneficial/deleterious components that are released in the gut during food digestion
- Determine the effect of the matrix structure on the bioavailability of food nutrients and bioactive molecules
- Gather scientists from different disciplines (food science, nutrition, physiology, gastroenterology, immunology...) to share and improve our knowledge on food digestion



Chair
Didier Dupont - France

Administrative
Manager



Nathalie
Le Marre



Vice-chair
Alan Mackie - UK



Dairy, Egg
Fruits & Vegetables
Meat, Cereals

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

WG1

BFC identification
Stability during processing
Food multi-scale characterization

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

Evaluation of the health effects

WG3

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



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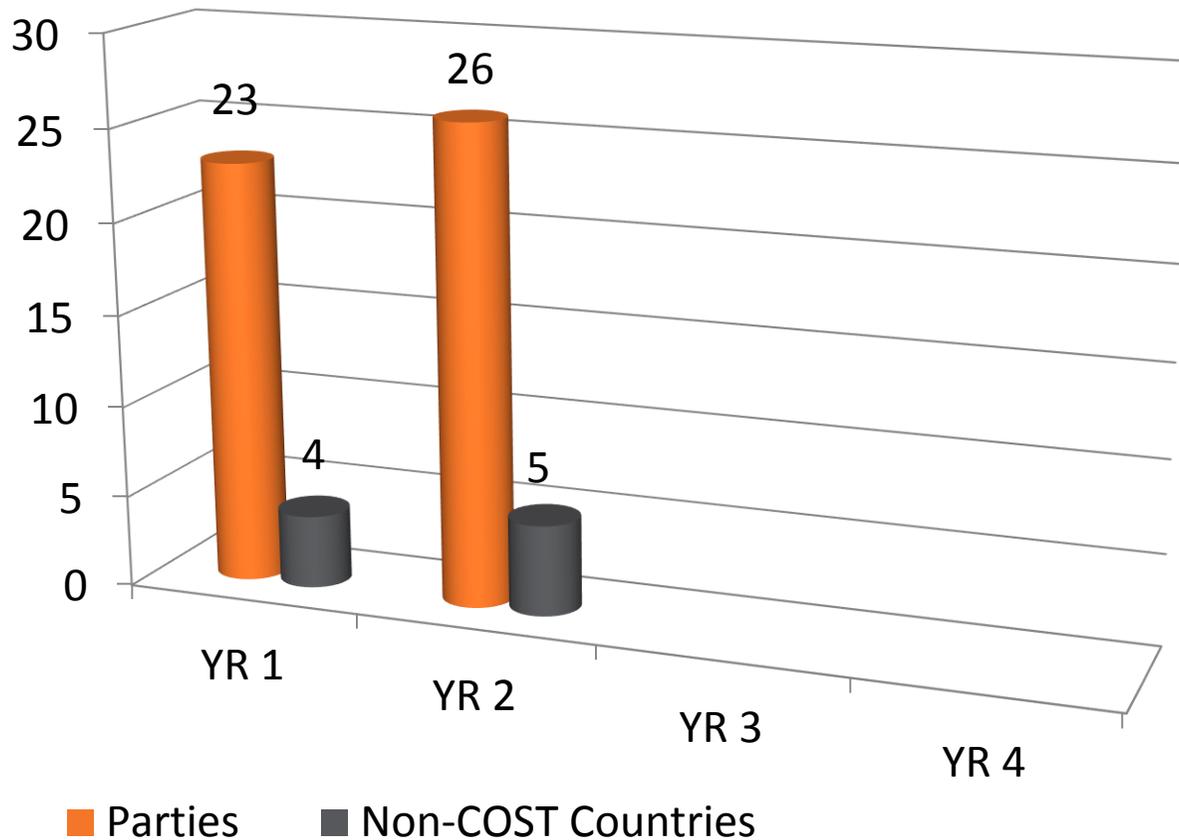


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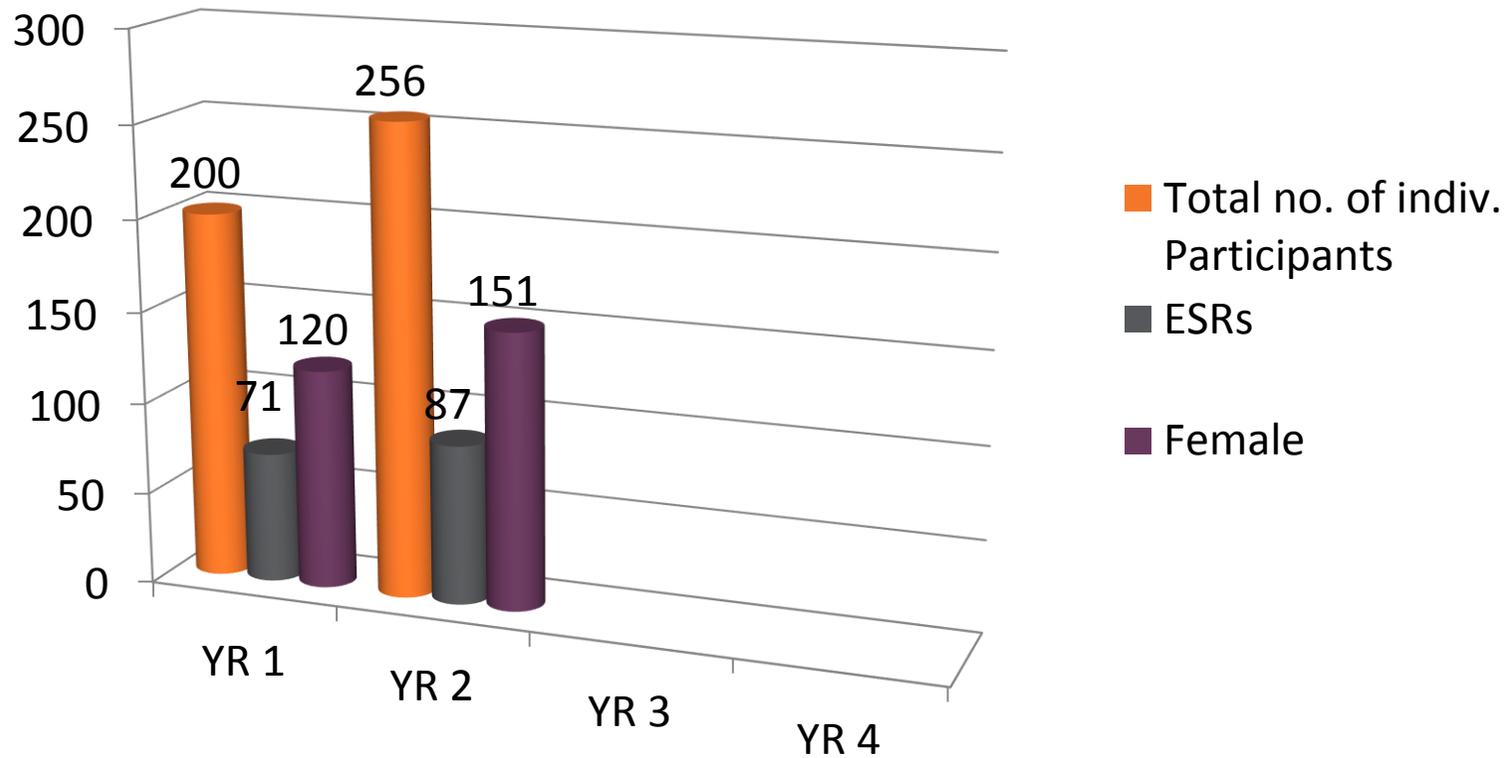
Tor Lea
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Action Parties



Grant Holder:
INRA
Didier DUPONT
France

Action participants





Tech Univ Denmark Univ Aarhus Univ Copenhagen MTT Univ Oulu Univ Eastern Finland
 Norwegian Univ Life Sci Chalmers Univ Tech VTT Nofima Riga Stradin Univ Univ Ljubljana
 NIZO TNO Lund Univ Univ Zagreb



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 Lithuanian Univ HS
 Gdansk Univ Tech
 Maize Res Inst
 NGO
 Polish Academy of Sci
 Univ Belgrade
 Univ Novi Sad
 Aristote Univ Thessaloniki
 Centr Food Res Inst
 Ben Gurion Univ
 Technion



Argentina
 CONICET
 Univ Buenos Aires
 EUF



Australia
 Deakin Univ
 Univ Queensland



Albania
 Agric Univ Tirana



Montenegro
 Ege Univ
 Pom Med Univ



New Zealand
 Riddett Inst
 Plant Food Res

270 scientists - 90 institutes – 31 countries

Use of COST Instruments

Activity (No.)	Year 1	Year 2	Year 3	Year 4
MC/WG Meetings	3	3		
STSMs	4	7		
Training Schools	0	1		
Workshops or Conferences	3	3		
Joint Publications	17*	38*		

Results vs. Objectives

All the objectives listed in Work-Budget plan for Y2 achieved:

- International multi-scale characterization of model foods (pasta, dairies...)
- Ring trial for an international comparison of *in vitro* digestion protocols
- Harmonization of *in vitro* digestion models
 - ☞ 1 “Infogest-approved” model
- Publication plan adopted in each WG
- FA1005 gathers most of the EU scientific community involved on Food Digestion + world-leading institutes
≈ **260 participants, 89 institutes, 31 countries**
- Strong connections developed with the food industry (55 companies) through questionnaire + workshop
- Strong connections developed with EFSA and EC

Significant Highlights in Science or Networking (1/2)

FA1005 gives birth to spin-off projects/proposals

- More than 60 National projects funded all over Europe raising more than 43,4 M€
- 8 Bilateral project funded for more than 3,2 M€
- Trilateral project funded between Poland, The Netherlands and Ireland (250 k€)
- 3 European projects funded (6,7 M€) –
Pathway-27 University of Bologna
26 partners – 70% of academic are INFOGEST partners



A new harmonized *in vitro* digestion protocol

- Step 1** • Questionnaire sent to all the participants for describing the protocol they were using 📁 45 ≠ protocols collected in a database
- Step 2** • Listing of each parameter (pH, digestive enzyme and bile concentration...) essential to be kept in a harmonized protocol
- Step 3** • Review of the literature to find physiologically-relevant data for each parameter and set-up of a harmonized protocol
- Step 4** • Application of the protocol to the digestion of milk and pasta samples in an inter-laboratory trial
- Step 5** • Publication and dissemination of the protocol to the international scientific community (peer-review publication, oral conferences...)

Challenges & Future Plans

- How to involve food industry in Action FA1005?
 - ☞ Publication of an industry newsletter
 - ☞ Integration of industry participants to the WGs
 - ☞ Invitation to the FA1005 events (13 companies participated to the conference, some even sponsored it!)
- Determine the influence of food processing on nutrient bioaccessibility through a ring-trial
- Development of a harmonized dynamic *in vitro* digestion protocol
- Writing of books, reviews and original articles
- Lobbying for getting project 9 (validation of *in vitro* models for the *in vivo* prediction of the behaviour of food ingredients in digestion, absorption...) proposed by ETP Food for life as a topic in the first call of Horizon 2020

Detailed Research Areas

Project 9: Validation of *in vitro* models for the *in vivo* prediction of the behaviour of food ingredients in digestion, absorption, distribution, function and elimination



Expected Impact:

Collaborative efforts of **academia and industry should define and validate** such studies for the sake of defining “normality” in responses to food intake challenges and for deriving novel biomarkers.

This can conceptually be validated also with putative health-promoting ingredients and should encompass measures that employ all available life science technologies.

Scope:

The limits (capacity, money, regulations) in assessing the **fate of food ingredients** with respect to human metabolism and health are overcome by a more wider use of **in vitro models** simulating the human metabolism and response (i.e. artificial intestine) including in **silica models**.

Although such models may be valuable, only very limited (if not all) **validation** has been carried out. As advantages these *in vitro* models may be, as limited they are. A concerted effort of academia and industry should validate some of the models, define their most useful applications and define the limits. This is of equal importance for **academic researchers as well as R&D experts in industry**.