THE HEALTHGRAIN PROJECT
and whole grain products

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EXPLOITING BIOACTIVITY OF EUROPEAN CEREAL GRAINS FOR IMPROVED NUTRITION AND HEALTH BENEFITS

Optimum use of components of grains and of bread making

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HEALTHGRAIN – FIGURES and NAMES

- Duration 5 years (01-06-2005 – 31-05-2010).
- Budget 16 mEUR

- 43 partners from 15 countries; 11 of these are companies

- Coordinator: Prof. Kaisa Poutanen, VTT, Finland
- Module leaders:

1. Prof. Richard Shepherd, University of Surrey, UK
2. Prof. Peter Shewry, Rothamsted Research, UK
3. Prof. Jan Delcour, Catholic University of Leuven, B
4. Prof. Inger Björk, University of Lund, S
5. Drs. Jan Willem van der Kamp, TNO, NL

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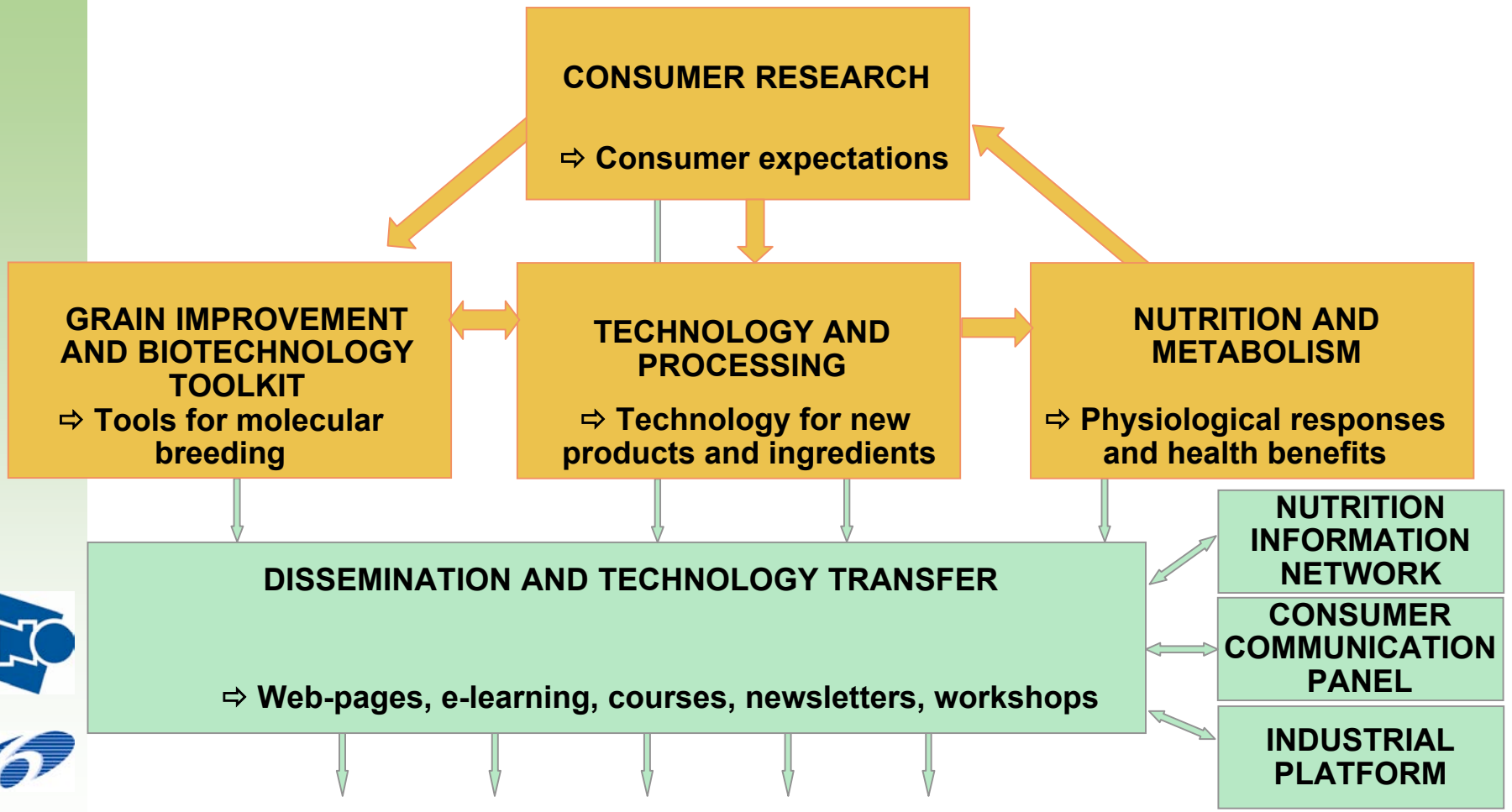
HEALTHGRAIN PROJECT STRUCTURE

Integrated project: *'from fork to farm'*- 5 Modules



Breeders, food industry, trade, consumer organisations, authorities

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What can we expect – in a nutshell

1) **Consumer research** _ potential health messages attractive to consumers, and approaches

2) **Breeding** _ methods and tools for breeders (focus: fibres, amylose, phytochemicals)

3) **Processing** _ new approaches for milling
_ novel fractions/ ingredients (aleurone, arabinoxylans),
_ new insights/ approaches for bread and pasta making

4) **Nutrition** _ new insights in role of ingredients/ fractions and product structure (e.g. impact of Glycemic Index)

5) **Technology Transfer and Dissemination**

Communication platform in Europe - grain product-health issues
_ wider understanding of (whole) grain health benefits among nutritionists, disease organisations (e.g. cancer, diabetes, heart health) and consumer organisations
_ close interaction with > 50 industries/ Industrial Platform
_ communication in Europe and world-wide

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Module 1 – Consumer research

Consumer studies in Finland, Germany, Italy, UK

Year 1: consumer expectations of healthy grain products

Year 3: what health claims (related to results of the project) are attractive to consumers?

First results:

- **3 main groups of consumers in all countries**
  - "all bread is healthy"
  - "wholemeal bread is much healthier than white"
  - "no interest in healthiness of bread"

  "THE consumer" does not exist
- **Benefits of whole meal bread: associated with fibre in all countries**
- **In UK – also association with heart health**

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Module 2 – Tools for breeders

FOCUS:

Breeding till now: 1. Agronomy, 2 protein 3: starch)

HEALTHGRAIN: selected vitamins/ phytochemicals, starch*, fibre,

Analysis of 200 (1st phase), and 25 (2nd phase) wheat and rye cultivars; different growing conditions / areas in Europe.

First results:

- Large variations in contents: > factor 2!
- Development of NIR database for easy analysis
- Tools for breeders will be developed for selecting cultivars with high levels of healthy compounds

* High amylose starch in wheat – higher fibre (resistant starch) in bread

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THE HEALTHGRAIN WHEAT DIVERSITY SCREEN

Plots at Martonvasar (Hungary), 1 June 2005

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ANALYSE BIOACTIVE COMPONENTS – Cooperation!

PHENOLICS/LIGNANS
GC-MS
LC-MS

Helsinki/Rothamsted

ALKYLRESORCINOLS
GC-MS

IHAR/SLU

STEROLS/TOCOLS
GC-MS
LC-MS

Helsinki

FOLATE
Microbiological/HPLC

Helsinki

SPATIAL DISTRIBUTION
phenolics/AX

FT-IR microscopy
Raman microscopy
Immunochemistry

IFR/INRA

STARCH
enzymatic/Megazyme

Tuscia/IHAR

FIBRE
•Arabinoxylans (AX)
–Total, Water (Un-)
Extractable **WU** and **WE**
•β-glucan

GC
enzymatic/Megazyme
xylanase
Fingerprinting

Leuven/INRA/IHAR

XYLANASES/INHIBITORS
enzymatic/Megazyme

Leuven

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Breeding – communication of first results

Results of diversity screen:

- Journal of Food and Agricultural Science - Special issue (Spring 2008)

- End of 2007: communication of data to members of HEALTHGRAIN's Industrial Platform

- Methods Book – describing all analytical methods used Published by AACC Int'l – 2008.

- Training course on analytical methods (Poland, spring '08)

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Module 3 - Processing

- **Innovative dry fractionation technologies**

_ flours with increased nutritional value and concentrated bio-active compounds (e.g. as ingredient or starting material for further wet extraction). Focus on aleurone layer of wheat kernel

- **Wet processing technologies** (enzymes, fermentation) **for getting wheat/ other cereal grain healthy ingredients**

_ concentrated phenolic compounds and wheat fibres:

- high MW arabinoxylan, arabinoxylan oligosaccharides
- slowly digestible and resistant starch

- **Technologies for final products attractive to consumers**
- better understanding of interactions of gluten in dough with whole grain components
- fermentation technologies (e.g. for higher lignan levels)
- technologies for slower rate of digestion (e.g. more resistant starch)

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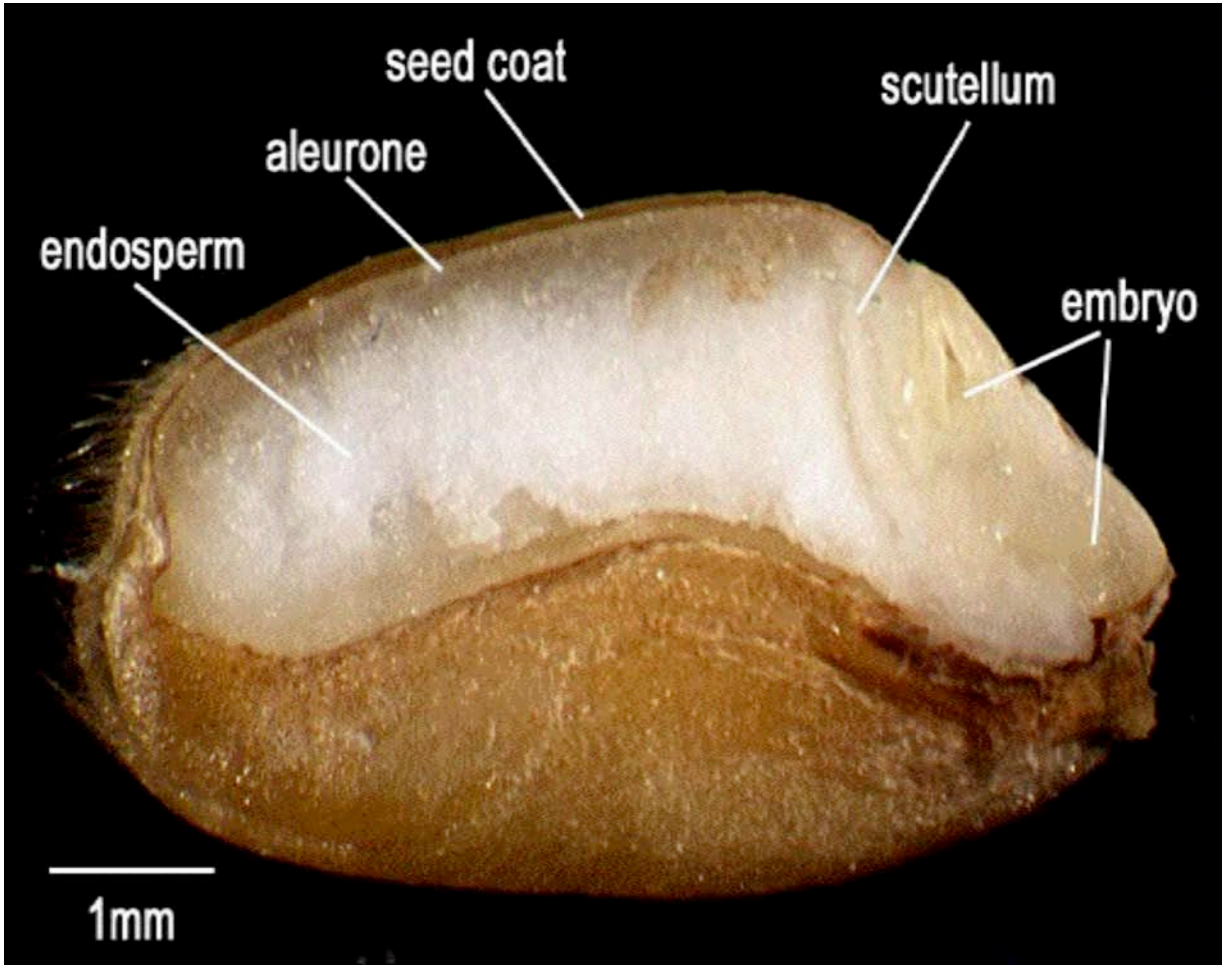
Aleurone layer – the inner bran layer

The aleurone layer, the "best of the bran," where most of the desirable whole-wheat nutrients are concentrated

Concentrated Aleurone, added to white flour – A key topic in HEALTHGRAIN for technology and nutrition studies

Expected properties: health effects comparable to whole grain, appearance/ taste close to white bread



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Module 4 - Nutrition and metabolism

Animal models & **advanced *in vitro* systems** for studies on

- **bio-availability of whole grain components**
- **anti-oxidant capacity and effects** (e.g. anti-inflammatory effects)
- **fermentation in colon, and compounds formed**
- **mechanisms of preventing/ reducing inflammation**

  (inflammation = the stage before heart diseases, diabetes etcetera)

Human studies – from small to large

- **with healthy and subjects 'at risk'** (for diseases such as diabetes)

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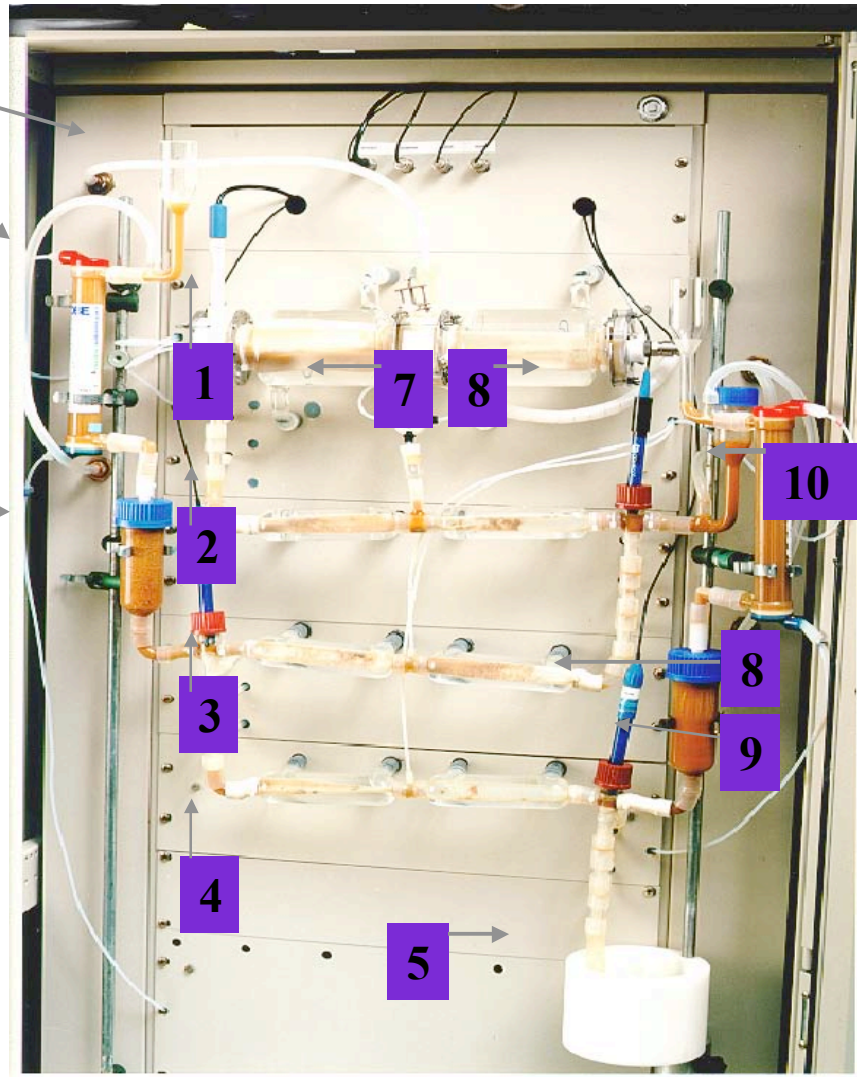
Example of efficient *in vitro* research: TIM-1 system

– TNO *in vitro* system representing stomach and small intestine



1. stomach + pyloric sphincter
2. duodenum
3. jejunum
4. ileum
5. ileo-caecal valve
6. gastric secretion
7. intestinal secretion
8. pH electrodes
9. pre-filter

10 absorption system

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Module 5 - Dissemination and Technology Transfer

objectives and activities

Work Package 5.1

1. **Interaction with Stakeholder Groups**
   Industrial Platform, Nutrition Information Network, Consumer Communication Panel
2. **Technology Transfer** (Workshops, Training courses)
3. **Dissemination** (science, industry, consumers; European and national/regional)
4. **IPR –** Intellectual Property Rights
5. **Training**

Work Package 5.2. website activities www.healthgrain.org

1,2 Website – advanced functionalities,
– communication to outside world

3. **E-learning**

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Module 5 – Industrial Platform, Nutrition Information Network and Consumer Communication Panel

Industrial Platform (IP) - First circle of stakeholders

- Membership fee: € 25.000,-- SME's: € 2.500,-- (< 250 personnel)
- Members can attend Annual HEALTHGRAIN Meetings
- Access to HEALTHGRAIN Workshops
- Access to protected part of HG Website
- No rights on IPR based on HEALTHGRAIN information
- Membership: 57 (incl. the 6 Industrial HG Participants)

Nutrition Information Network (NIN)

26 EU food/health experts, **involved in nutrition recommendations.**

Consumer Communication Panel (CCP)

9 persons / organisations involved in communication to consumers and industry on cereal based products

- New healthy products require acceptance by nutrition experts and organisations involved in communications to consumers

- **NIN and CCP Members include representations of**
  - Association of European Cancer Leagues
  - Association Of European Coeliac Societies
  - International Diabetes Federation,

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57 Industrial Platform members - of 14 countries

1 Austria	Saatbau Linz
4 Belgium/Japan	Cargill, *Puratos, Tate & Lyle,* Nisshin Flour Mills
3 Denmark	Danisco, Novozymes, Sejet Plantbreeding
8 Finland	Avenly, Fazer, Helsingin Mylly, Koff, Linkosuon Leipomo, Vaasan &Vaasan, Primulan Leipomot, *Raisio,*
9 France	Arvalis, Chopin, Danone, Goemar, Grands Moulins de Paris, Lesaffre, Livrac, Panzani, Eurogerm/BTC
7 Germany	BILB, Böcker, N-zyme Biotec, Jäckering, Kampffmeyer, Kraft, Saaten-Union
3 Italy	*Barilla,* Prosementi, Rizzollio
11 Netherlands	Bolletje, CSM, DSM, Isolife, Kerry Bio-Science, Kellogg, Mars, Meneba, Ranks Meel, Unilever, Sonneveld, Zeelandia
1 Spain	Agrasys
1 Sweden	Läntmannen
3 Switzerland	*Bühler,* CreaNutrition, Nestlé
4 UK	*Branscan,* CPW (Cereal Partners Worldwide), Holgran, National Starch
1 Turkey	Doygun

8 Agriculture, 8 Flour mills, 16 Food ingredients,
19 Consumer products, 3 Equipment. *20 SME.* ***37 Non-SME***
6 HEALTHGRAIN research participants. *(small & medium enterprises, <250p.)*

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Food and Health – the European context

- **EU Regulation on Nutrition and Health claims made on foods** Into force: January 2007 – transition period till 2010.

- **Food Safety - Concerns about**
  - o Overall unhealthy composition of products (high fat, sugar, salt)
  - o Toxic compounds: mycotoxins, acrylamide

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HEALTHGRAIN and Wholegrain Campaign Network

HEALTHGRAIN needs to develop materials for consumer organisations/ organisations for promoting the consumption of (whole) grain based products.

HEALTHGRAIN has limited experience in this area And looks forward to learn from WCN contacts

HEALTHGRAIN – with all its EU researchers, industries, and leading nutritionists is well suited to globalise WCN efforts beyond North America

HEALTHGRAIN acknowledges the importance of whole grain but will not identify itself with whole grain