

EVENT REPORT

5th International Dietary Fibre Conference (DF12) – 7–9 May 2012, Rome, Italy

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Introduction

Held in Rome, 7–9 May 2012, the 5th International Dietary Fibre Conference (DF12) followed up on the highly successful formula of the earlier Dietary Fibre Conferences between 2000 and 2009. The Conference set out the state of the art of dietary fibre (DF) research, and drew participants' attention to recent DF definitions, to the most updated methods of analysis, to regulatory and labelling matters, to the relationship between fibre consumption and health, to the different DFs and their co-passengers, as well as to consumer acceptance of fibre-rich products. In a final Session, titled *Where do we go from here?*, the Conference also challenged scientists and industry positions on future studies and developments in DF, and expressed a strong call on the need for research that assesses consumer needs, and that is not only focused on feasibility and economy drivers.

The 5th International Dietary Fibre Conference (DF12), organized by the Italian National Research Institute on Food and Nutrition (INRAN) with the support of the International Association for Cereal Science and Technology (ICC), was held at the Centro Congressi 'Fontana di Trevi' in Rome, Italy, and brought together more than 250 participants from 38 countries from around the six continents. Major participating countries were Italy, the Netherlands, United States, France, Belgium and Finland.

The DF12 followed up on the highly successful formula of the earlier Dietary Fibre Conferences in Vienna (2009), Helsinki (2006), Noordwijkerhout (2003) and Dublin (2000): it was held in an *attractive location* linking the modern with the traditional, Rome being the cradle of progress and civilization of the Ancient world in a fertile cultural forum where information and ideas could be shared and innovation developed. It provided opportunities for both young and senior scientists and industry representatives for *networking and exchanging knowledge* about 'dietary fibre' (DF). It

offered participants an *outstanding scientific programme* with nine scientific sessions and almost 180 presentations, thereof 55 speeches by speakers from all corners of the globe and about 120 posters. It addressed and attracted the global scientific community, as well as international stakeholders from the food industry to discuss *new products and consumer preferences* in the DF area.

The DF12 also enabled the *meeting between science and research and innovation and marketing*, thanks to the 12 companies that sponsored and supported the event as exhibitors (General Mills, Kraft Foods, Tate & Lyle, Barilla, Corn Products International, Cosucra, Megazyme, National Starch, Sensus, ICC, AACC and Eurofins). These companies could actively interact with scientists, thanks to their table top exhibitions of products, equipment and scientific tools, and in so doing also contributed to giving an in-depth insight into the state of the art of product innovation and development in the DF area.

In detail, DF12 offered participants eight Scientific Sessions with an extensive coverage of the DF topic from both a traditional and an innovative perspective, and a ninth Session, *Where do we go from here?*, challenging scientists and industry to give an outlook on the future perspective of DF seen from different viewpoints.

Opening session

The *Welcome address* was given by Marina Carcea, Chair of the DF12 Organising and Scientific Committee of the DF12, on behalf of both the INRAN, based in Rome, Italy, and the ICC, thereof she is President for the period 2011–2012. She expressed her honour and pride to organize this internationally outstanding scientific event, and together with Roland Poms, ICC Secretary General, highlighted how DF12 was a further evidence of ICC's commitment to the furtherance of science and technology in hot and debated topics such as DF,

after the boosted discussions within the global scientific community in terms of development of new analytical methods and revision of the DF definition worldwide.

In the second part of the Opening Session, Dr Ruth Charronière, invited speaker from the Food and Agriculture Organization (FAO), Rome, Italy, delivered a speech on *Dietary Fibre – definitions, methods and implications*. Besides general matters regarding DF, she focused on the major fibre definitions/methods used in food composition tables (FCTs), the recommendations for DF intakes, as well as some data regarding DF supply based on the FAOSTAT food supply data of 2005/2007. She also stressed that harmonization efforts were initiated over 40 years ago, but a lot of work still needs to be done despite recent achievements. In particular, she stated that though the new AOAC 2009.01 method seems promising, it needs more validation before inclusion in FCT and use for consumption studies. It was strongly pointed out that food databases will wait for the introduction of results coming from the new methods until a large number of results have been generated.

Session 1: fibre definition, analysis, impact on food composition database, dietary recommendations and labelling

Session 1, chaired by Jan Willem van der Kamp (TNO, NL) and Stéphane Vidry (ILSI Europe, Belgium), started off with an overview of the most debated facets of DF. Five authoritative speakers presented on the new definitions, the classical versus new methods and validation thereof, the challenges for national food databases and dietary recommendations.

Jonathan DeVries (Medallion Laboratories/General Mills, USA) drew audience attention to the *adoption of an international standard definition in 2009 by the CODEX Alimentarius Commission*, slightly modified later in 2010, which was the result of more than 16 years of scientific research, debate and collaboration. He also highlighted how the analytical community validated methodologies between 2007 and 2011 that could fulfil the requirements of the definition and how this process was full of hurdles.

Before this speech, Barry McCleary (Megazyme International Ireland, Ireland) raised the question of *which validated method to use for measurement of DF*. McCleary reasoned on the fact that after the recognition of resistant starch and non-digestible oligosaccharides as DF, new methodologies for the measurement of total DF were developed, and in 2011 the Codex Committee on Methods of Analysis and Sampling endorsed 17 methods of analysis for DF. Despite this number of endorsed methods, the questions ‘Which

method to use?’ and ‘Is there any justification for the use of non-validated or endorsed methods?’ are still controversially debated.

Meinolf Lindhauer (Max Rubner-Institute, Germany) presented the considerable changes in the concept and definition of DF; in particular he focused on the definition laid down in the EU directive 2008/100/EU. From the analytical point of view, he stressed both, – how AOAC methods 985.29 and 991.43 were shown to be inappropriate in correctly assessing low molecular weight DFs, as well as the differences in results between old and new methods, e.g. the *AOAC method 2009.01*, in terms of content of low molecular weight DFs. These results imply that the total DF content of foodstuffs is higher than believed before; he stressed the need for adaptation of DF data present in all kinds of official databases.

The *new challenges for food databases in Europe*, in terms of a reasonable time and acceptable financial means for an update, were handled by Susanne Westenbrink (National Institute for Public Health and the Environment, the Netherlands). She insisted on the fact that after Codex Alimentarius and EU agreed on a new definition for DF and after that results from new methods showed higher DF values in particular in foods containing oligosaccharides and resistant starch, more foods are expected to be eligible for ‘source of’ and ‘high in’ DF. As a consequence, she described the updating of current DF values in national food composition databases as a big future challenge.

Julie Miller Jones (St Catherine University, USA) addressed the topic of *dietary recommendations*, regulations and popular diets, and impact thereof on fibre intake. In particular, she stressed how DF and whole grain intakes are far from recommended levels. She also stressed the importance of the definition of whole grain food for both research and product labelling.

Session 2: nutritional roles of intrinsic, isolated and synthetic fibre

Chaired by Mary Ellen Camire (University of Maine, USA) and Ximena Lopez (Granotec Chile and ICC Region Representative for South America, Chile), this session started off with the question: ‘Are synthetic dietary fibres beneficial for human health?’ Mary Ellen Camire stressed the inclusion of compounds not found in nature, such as polydextrose and chemically modified cellulose and starch, in the definitions of DF by the Codex Alimentarius Commission and AACC International. She also reported about consumers’ and media groups’ concerns whether these compounds possess

the same health benefits as isolated or intact fibres from plants. For the time, knowledge gaps exist in the demonstration of their health effects, lack of studies comparing synthetic fibres directly with those from natural sources, as well as lack of human studies evaluating methyl cellulose. However, before leaving the floor to the next speaker, she stated that synthetic fibres appear to function similarly to 'natural' fibres, but she called on the need of both more human research with strong experimental designs before any of these products could be considered for a health claim, as well as studies, using target products such as cereals or cookies, that should include those fibres.

After an analysis of synthetic fibres, Sumiko Kanahori (Matsutani Chemical Industry Co., Japan) drew the audience attention to a non-viscous soluble source of DF, *resistant maltodextrin (RMD)*, and its efficacy on visceral fat accumulation and glucose and lipid metabolism in humans with metabolic syndrome. What emerged from the study undertaken by her team was that the effects of RMD in humans with metabolic syndrome are: decreased serum triglyceride, improved insulin resistance and decreased visceral fat. So, despite the need for further studies to investigate its efficiency, she stated that a continuous intake of RMD would be useful for the prevention of the metabolic syndrome.

The speech by Diederick Meyer (Sensus, the Netherlands) was focused on fermentable fibres, in particular *oligofructose*, as promising ingredients in controlling energy intake through their effect on gut hormones involved in satiety such as GLP-1 and PYY. In particular, the main outcomes of his study on how much oligofructose consumption lowers energy intake in healthy humans were presented, with particular attention to the effects of two levels of oligofructose on the modulation of food intake, appetite profiles and blood levels of satiety hormones in healthy human volunteers. Apparently, oligofructose also offers excellent possibilities for the development of tasty high fibre products for increased satiety or weight management, when combined with low caloric value and sugar-replacing features.

Cristophe Courtin (Katholieke Universiteit Leuven, Belgium) presented the *gastrointestinal effects that consumption of bread containing in situ produced arabinoxylan oligosaccharides* can have on healthy humans, in terms of intestinal fermentation and overall gastrointestinal (GI) characteristics. Finally, the last speech of the first conference day was delivered by Voker Landschütze, CEO of *aevotis GmbH* (Germany), who addressed the issue of the *impact that commercial sources of soluble dietary fibres with physiological and physical properties, can have on the overall performance of finished foodstuffs*. Starting from the consid-

eration that food formulators are more and more demanding functional fibres that deliver nutritional benefits and product compatibility without impacting negatively on taste, texture and flavour, he presented some preliminary data regarding Fibremalt, a novel soluble DF, developed by his company by means of bioconversion technology to address the above-mentioned demand.

Session 3: dietary fibre in food processing – how to deliver dietary fibre in processed foods

The second conference day was opened by Meinolf Lindhauer (Max Rubner Institut, Germany) and Charles Brennan (Lincoln University, New Zealand), chairmen of Session 3, who introduced six authoritative speakers that provided an extensive overview of how DF is delivered in processed foods. In a keynote lecture, Nesli Sozer (VTT, Finland) started off with general considerations about the influence that changes in ingredient formulation and/or processing could have on food characteristics such as appearance, texture, digestibility rate and flavour release. In particular, she focused on the *influence that dietary fibre addition, in the form of bran, could have on the texture of the food matrix and on the formation of stable air cells*, by reporting the main outcomes of an experimental work performed at VTT to understand the effect of bran particle size on both structural and mechanical characteristics of extrudates.

The second speech of the day, delivered by Cécile Barron from INRA (France), was more related to the technological challenges depending on the fact that composition and structure of fibres vary according to the tissue they originated from: wheat fibre properties show a high variability according to their origin within the grain. Barron reported on the main outcomes of the research undertaken by her team on the production of fractions enriched with selected fibres from the outer layers. In particular, she provided an overview of the development of a *dry fractionation process*.

Terry Finocchiaro (National Starch, USA) talked about the importance of Resistant Starch 2 (RS 2), a specific naturally occurring form of RS, recently used by food manufacturers to enrich and stabilize their products with relatively high concentrations thereof, without adversely impacting the quality of commercial food products. In particular, he presented *analytical options for measuring RS in foods, analytical methods for quantifying TDF/RS*, and finally provided an overview of *total dietary fibre (TDF) analysis and retention in RS-fortified food products*.

In this session, an important socio-economic issue, like the production of gluten-free foods, was also addressed. As a matter of fact, Anne-Sophie Hager from the University College Cork (Ireland) reported on the *role of dietary fibre in gluten-free bread making*: fibre ingredients and hydrocolloids (cellulose and derivatives, locust bean gum, xanthan, guar gum) are often used to overcome the quality issue related to the production of gluten-free bread and to increase the nutritional value of such foods. She presented some fibre-rich gluten-free foods and the possibility of enrichment with soluble fibres, such as inulin and oat- β -glucan. The influence of xanthan and hydroxypropyl methylcellulose into gluten-free bread, as well as the addition of sourdough fermented with exopolysaccharide producing lactic acid bacteria, were also illustrated.

Secil Turksoy (Ankara University, Turkey) presented a speech on the *incorporation of dietary fibre powders from citrus fruits into cookies* and the effects that added fibres have on the polyphenol content and on the distribution of DFs (total, soluble and insoluble), on the antioxidant capacity and on cookie characteristics. The Session was closed by Dimitra Lebesi (University of Athens, Greece) with an experimental study on the *incorporation of a potential dietary fibre source like endoxylanase-treated cereal brans in cakes*. Lebesi reported that treated cereal brans enable the increase in fibre intake and the development of new bakery products with high nutritional value and quality characteristics.

Session 4: challenges in formulating fibre-rich foods to address the dietary fibre consumption gap

This Session, chaired by Kaisa Poutanen (VTT, Finland) and Ascension Marcos (CSIC, Spain), provided an overview of challenges in formulating fibre-rich foods, and actions to be taken to address the DF consumption below the recommended levels. The first speech was by Charles Brennan (Lincoln University, New Zealand) who delivered a keynote lecture on *extruded cereal snack products, the glycaemic response to them and the investigation of interactions water-starch-fibres*. The data presented in this speech showed that extruded cereal snack products are regarded as potentially high glycaemic foods. As a matter of fact, they are starch rich, and the extrusion process makes starch components more readily accessible to enzyme digestion, and it increases the postprandial glucose release from such products. However, Brennan pointed out that the ability of products to absorb water has a significant impact on starch degradation and hence glucose release; therefore, understanding water-starch-

fibre interactions is an essential element in determining the glycaemic modulating behaviour of fibre components.

Janusz Kapusniak (Jan Dlugosz University in Czestochowa, Poland) presented a research work on new starch preparations with prebiotic properties, in particular the preparation of *dextrins* by combining two factors responsible for starch resistance, temperature and chemical modification, which imply the production of a higher content of the fraction inaccessible to human digestive enzymes. In his speech, Juhani Sibakov from VTT, Technical Research Centre of Finland, presented a dry fractionation method that uses electrostatic separation, developed jointly by VTT and INRA, to further increase the amount of β -glucan in defatted oat bran concentrates. This method follows the EU health claim that oat β -glucan can lower blood cholesterol, and the deriving challenge of formulating foods with a sufficient amount of β -glucan in the final product. Maria Milašinović Šeremešić (Maize Research Institute, Serbia) reported the main results of an experimental work for the *determination of the influence of water and resistant starch addition on cookie dough properties*.

Mirosław Kasprzak, from Aarhus University, Denmark, gave a talk on the *physicochemical and nutritional properties of the dietary fibre-rich breads and their dried and pelleted counterparts*. The effects of various soft bread on acute glycaemic response were studied in conjunction with the metabolic syndrome, whereas the effects of breads in pelleted form were studied in Zucker Diabetic Fatty rats. The Session was concluded by Marise Pollonio (State University of Campinas, Brazil) with a talk on the *Sensory properties of Bologna sausage elaborated with resistant starch as fat substitute*. There is a search for fat substitutes, and some DFs have been used for this purpose in meat products. In this speech, the main outcomes of a study on the possibility to produce low-fat Bologna sausages by using resistant starches as fat replacers as well as the impact on the sensory properties of the sausages were presented.

Session 5: fibre, fermentation and health

Are short chain fatty acids important signal molecules? With this question, the two chairmen of Session 5, Furio Brighenti from the University of Parma (Italy) and Tony Bird from CSIRO (Australia), gave the floor to the first speaker of the Session, Edward Chambers (Imperial College of London, UK). In his keynote lecture, he first reported about the recent focus on the relationship between the colonic microbiota and a number of chronic diseases such as obesity and type 2 diabetes. In particular, he presented the hypothesis accord-

ing to which products of fermentation from dietary carbohydrate and protein by the microbiota, short chain fatty acids (SCFAs), may contribute to energy capture and therefore increase total energy intake and contribute to the risk of developing obesity. What emerged in this lecture was the existence of a SCFA receptor system that has the potential to affect appetite regulation and insulin sensitivity, although the relatively high concentrations of SCFA needed to activate the receptor are a challenge when targeting this receptor system as a method of weight management. Damien Belobrajdic (CSIRO, Australia) talked about the investigation on the effect of fructans extracted from wheat stem and barley grain on intestinal fermentation patterns *in vivo*, on the basis of the assumption that *in vitro* studies suggest that cereal fructans are fermented differently to those from chicory.

Microbiota and SCFA were the topics addressed by Floor Hugenholtz (Wageningen University, the Netherlands) as well. The researcher posed in her contribution the question: *how do fibres change gut microbiota and their SCFA production?*, and then reported on the main outcomes of a fibre screening study aiming at (a) identifying the interactions among diet, microbiota and host; (b) studying them quantitatively; as well as (c) using metadata for integrated modelling. Rosa Montella, from the Oriental Piedmont 'A.Avogadro' University, Italy, delivered a speech on the *chemical and functional properties of fibre isolated from hazelnut skins* that are mostly considered a waste. In fact, they are an underutilized by-product, and recent studies have showed that they are a rich source of natural antioxidants. Rosa Montella provided new insights into the extraction of fibres from hazelnut skins, their functional testing and analytical characterization by accurate mass spectrometry. Microbiota were the focus of the last lecture of the session, where Dennis T. Gordon (PIC&PC, USA) passionately discussed the *role of non-fermentable and fermentable dietary fibre in the intestine and microbiota development and maintenance*. In particular, he provided qualitative and quantitative data on the microbiota during the development and maintenance of the intestine and their association with DF intakes, both non-F-NDC and F-NDC.

Session 6: benefits of dietary fibres and their co-passengers

Jonathan DeVries (Medallion Labs/General Mills, USA) and Jan A. Delcour (KU Leuven, Belgium) chaired the last session of the second conference day. Vincenzo Fogliano (University of Naples, Italy) explained the role of *antioxidant dietary fibre (ADF) in vivo*, and reported about the main

outcomes of an intervention study with whole grain in overweight subjects. He showed that antioxidant compounds bound to DF exert multiple actions both inside the GI tract and at the systemic level and that ADF can be considered a perfect 'natural' tool to deliver the antioxidant compounds into the colon.

Susan Cho (NutraSource, USA) delivered a speech on *association between intakes of bran, cereal fibre, and whole grains and the risk of type 2 diabetes: systematic review* where she emphasized that the preponderance of scientific evidence shows an inverse association between the intake of mixtures of bran and whole grain and the reduction of risk for T2D. She also concluded that concentrated cereal fibres and bran can make significant contributions to healthful dietary practices and reduce the risk of T2D.

Mette Hedemann (Aarhus University, Denmark) highlighted the *importance of betaine as a co-passenger of DF*. In particular, she presented the close relationship between betaine and whole grains: a high content of betaine is formed in cereals, especially wheat and rye; its presence is preponderant in bran, more specifically in the aleurone layer; elevated plasma betaine levels in pigs, rats, humans are due to wholegrain consumption. On the basis of these assumptions, she also presented the main outcomes of her experimental study by stating that (a) betaine added as a supplement is highly available and rapidly absorbable; (b) betaine from a cereal source is more slowly absorbable; and that (c) there is no difference in the absorption of betaine from rye bread with or without rye kernels.

The last speaker of the session was Anna Marja Aura (VTI, Finland) with a speech on the *effect of processing on conversion of phenolic acids from cereal matrices in vitro and in humans*. She reported on the development of *in vitro* digestion models, simulating both the upper intestine and the colon, to compare different types of bran fractions as such or baked in bread, and finally concluded that bio-processing of rye bran enhanced the *in vitro* colonic SCFA formation and the release and conversion of ferulic acid. She also called on the need for more studies to address the impact of whole grains in the circulating metabolites and their correlations with the health parameters as well as to elucidate the mechanisms behind the effects.

Session 7: dietary fibre impacts on human physiology and physical and mental health

This Session, chaired by Julie Miller Jones (College of St Catherine, USA) and Hannu Salovaara (University of Hel-

sinki, Finland), started off with a comparison of the literature on the *association between intakes of bran, cereal fibre, and whole grains and risk and biomarkers of heart disease*, by Lu Qi (Harvard School of Public Health, USA). An overview of reviews highlighted how mixtures of whole grains and bran are consistently associated with 7–52% reduction of cardiovascular disease (CVD) risk. In particular, studies comparing whole grain and bran intakes show stronger associations between bran intakes and CVD risk. It was also pointed out that an inverse association between whole grain intake and risk reduction of CVD or its risk factors was attenuated after adjustment for cereal fibre or bran intake.

Anne Wanders, from Wageningen University (the Netherlands), provided an overview of the *effects that pectin with bulking, viscous and gelling properties can have on appetite*, as well as the underlying mechanisms. In particular, she concluded as a main outcome of her research that pectin with gelling properties decreases appetite ratings, decreases insulin response and slows down gastric emptying rate. Viscous pectin only reduces insulin response, whereas pectin with different properties affects appetite and its possible underlying mechanisms differently.

Kirstine Christensen (Aarhus University, Denmark) presented on the *acute metabolic response to different cereal dietary fibres in porto-arterial catheterised pigs used as model for humans*, and stressed that the aim of their study was a better understanding of processes involved in blood glucose regulation for the development of healthy food. Coby Eelderink (University Medical Centre Groningen, the Netherlands) pointed out three main points in her speech on *Pasta consumption elicits similar postprandial glucose, lowers gastric inhibitory polypeptide (GIP) and insulin response compared to bread*: (a) slower intestinal uptake of glucose from pasta results in a lower GIP and insulin response, but not necessarily in lower total glucose concentrations; (b) the similar glycemic response after bread and pasta can be explained by the slower uptake of glucose into tissue; and (c) low GIP and insulin response to slowly digestible starch might reduce the risk of developing metabolic disorders.

Susan Tosh (Agriculture and Agri-Food Canada, Canada) provided an overview of the *Mechanism of action of oat β -glucan in reducing LDL-cholesterol*. Based on the knowledge that oat β -glucan potentially affects a number of physiological functions that could account for its beneficial effects, its mechanism of action was investigated by her team by means of a clinical trial, and it emerged that cholesterol synthesis did not increase, bile acid synthesis was not draining stores of cholesterol and that bile acid excretion was not driving cholesterol reduction. Moreover, viscosity inhibited

absorption of cholesterol from the diet, no increased cholesterol synthesis was observed and cholesterol reduction could not be explained by production of SCFAs. Yohko Sugawa-Katayama (Osaka Aoyama University, Japan) highlighted that barley, widely cultivated in Japan and whose leaf powder is rich in DF, can have a *tumor-suppressive effect on colon carcinogenesis induced by dimethylhydrazine* in mice.

Session 8: consumers acceptance of fibre-rich products

Consumers are the target of a lot of policies related to DF, and several actions are being taken towards this food chain stakeholder: showing consumers the benefits of DF so to incorporate whole grains in their diets, ensuring correct identification of foods containing DF, offering DF foods with satisfactory organoleptic qualities, as well as encouraging their consumption. This session, chaired by Pierre Aymard (Kraft Foods Europe, France) and Joel Abecassis (INRA, France), started off with a keynote lecture on *Evolution of the fibre market: convergence of emerging science and evolving consumers as key drivers*. Lorraine Niba (Corn Products International/National Starch, USA) pointed out, in particular, the evolution of the fibre market as a result of the convergence of some key drivers like incorporation of fibre into new food categories, thanks to evolving ingredient technology; emerging science exploring the physiological benefits of fibre; and most importantly, an evolving and sophisticated consumer that continues to show interest in fibre and fibre consumption. In her speech, she also highlighted the increasing awareness of the benefits of fibre, the emerging pattern of increased consumption of fibre and fibre-containing products, and the major number of products launched with fibre.

Maja Tomaschunas (University of Applied Sciences, Germany) addressed the issue of *consumer demand for food with positive nutritional values such as fat-reduced products*. She presented, in particular, the details of a study on the evaluation of how fat, fat reduction and fat substitution in different food matrices may influence sensory properties and consumer acceptance. She reported on the use of different combinations of inulin, citrus fibre and rice starch, as fat substitutions. Laila Meija (Riga Stradins University, Latvia) delivered a speech on *dietary fibre intake and food sources in aged men and women in Latvia*, and showed how rye bread might be the most important source of DF in the Baltic republic.

Mary Stewart, from the University of Hawaii at Manoa (USA), highlighted the *minimal impact of resistant starch*

content of Dixie Belle and Rondo rice on sensory properties. Based on the assumption that RS behaves as DF and improves insulin sensitivity and postprandial glycaemic response, resistant starch content and sensory properties in two high amylose rice cultivars (Dixie Belle and Rondo) grown in the United States were evaluated. She stressed how RS content of rice may not affect the sensory quality negatively or the overall liking, thus suggesting that these may be acceptable ways to increase RS intake.

Carlo Rizzello closed the session with a speech on the use of micronized by-products from debranned durum wheat and sourdough fermentation to enhance the nutritional, textural and sensory features of white bread. He concluded his lecture by stating that the addition of micronized bran fractions increases the concentration of free amino acids, total phenols and DF, as well as the phytase and antioxidant activities of doughs. Moreover, sourdough fermentation further improves these nutritional features, and enhances the texture and sensory properties of bread containing bran fractions.

Session 9: where do we go from here?

Besides setting out the state of the art of DF, the DF12 also launched in its last session a challenge to scientists and industry representatives: *Where do we go from here?* In this Session, chaired by Barry V. McCleary (Megazyme International, Ireland) and Fred Brouns (Maastricht University, the Netherlands), scientists and industry representatives debated this issue and answered in perfect unison that in a highly political and confused world, concerted actions are needed to make a change in the field of DF. Fred Brouns in his keynote lecture stated that joint activities, shared expertise and shared facilities are desirable. In particular, it was called on the need for research starting from consumer needs and not primarily focused on business and economy drivers. As consumption takes place at the end of the food supply chain, only a sufficient consumer pull would justify innovation investments at all individual steps of the chain, and the creation of innovation may be leveraged only by merging insights from AGRI sciences, food science and technology, health/life sciences, and consumer sciences.

In his speech *Dietary fibre definitions: from a historical perspective to the way forward*, Jan A. Delcour (Katholieke Universiteit Leuven, Belgium) called on the need for more work to link the impact of prebiotics on the composition and/or activity in the GI microbiota to have benefits for host well-being and health, and also stressed that a successful outcome of such work can lead to a prebiotics health claim.

In a worst case scenario, according to Delcour, one may consider to abandon the term prebiotics as such term would offer little benefit over the use of the term DF.

Paul Wehling (General Mills Inc., USA) talked about the *interpretation of acceptance criteria of precision data generated by collaborative studies*, and stated that (a) trueness to definition should be the primary criterion for evaluating DF methods; (b) currently Codex definition method AACC 32–50/ AOAC 2011.25 is the state of the art for general DF methods; and (c) as new fibres are developed, the methods will evolve to assure accuracy to the DF definition. Joanne Slavin (University of Minnesota, USA) delivered a speech on *physiological effects of fibre: future challenges for moving uncertain outcomes toward certainty*, and concluded her speech by stating that not all fibres are equally effective on health outcomes. Biomarkers, in fact, demonstrated that the effects of one fibre may not apply to others, and fibre may act differently when removed from the intact plant structure. Moreover, she stated that research should move towards the enhancement of prospective, cohort epidemiologic studies and clinical trials of different fibers on energy (satiety), laxation, glucose control, lipid lowering, prebiotic effects, as well as towards the creation of protocols to determine differences between DF and functional fibres.

Priscilla Samuel, from Tate & Lyle Health and Nutrition Sciences (USA), posed the question *Emerging fibres and where do we go from here?* She provided an answer from the industry point of view and affirmed that while going forward, it is important for the industry not only to continue to invest in DF, their technology and health benefit substantiation, but it is also critical for the industry to educate both healthcare professionals and consumers about the value and differences in health benefits across fibres. She thus strongly called on the need for collaboration and partnership amongst scientific and regulatory environment, industry and consumers.

Poster presentations

Posters are often and wrongly regarded as less important than oral presentations, but actually poster presenters are always asked to handle a more difficult and demanding task: being eye catching and thought provoking in a 841 × 1189 mm frame, besides communicating science effectively. Posters are a demanding task for students, young researchers, as well as for senior ones, as they are asked to hone their writing and presenting skills, as well as their creative skills in attractiveness and design.

Besides the 55 speeches, the DF12 hosted an exhibition area with 121 poster presentations encompassing the broad scope of DF covering all topics presented in the scientific sessions.

Although effective science communication in posters is a big challenge, there were nevertheless excellent examples. Three juries for the Kraft Foods, General Mills and Wiley-Blackwell Awards first evaluated the submitted abstracts for the posters, and during the Conference also the respective posters. As it happens, any time a poster award is due, juries debate on the value of science and communication and where is the preponderant value: is good science poorly communicated less important than poor science well communicated? The answer is always the same: juries appreciate good science well communicated. So at the DF12, the three juries identified a set of relevant poster presentations in terms of clarity of abstract, title and scientific significance, language and text on the poster, style and arrangement of information, clarity of information, that is, not overpopulated but sufficient information, scientific quality, and last but not least, attractiveness of the design. The three juries met and shared their choice in order to avoid duplicate nominations and finally decided on four posters that were awarded in a dedicated ceremony.

Closing session and best poster awards

The award ceremony, chaired by the ICC President, Marina Carcea (INRAN), the ICC President Elect, Joel Abecassis (INRA), and the ICC Secretary General, Roland Poms, preceded the official closing session of the DF12, and was supported by 3 of the 11 companies that sponsored the event: General Mills, Kraft Foods and Wiley-Blackwell. Four prizes were awarded to the presentations that achieved the highest scientific and technical standard, and also displayed innovation and originality, selected among the 121 posters and the 55 oral presentations.

The *General Mills Award for Health Innovation* was received by Elin Johansson *et al.*, from Lund University, Sweden (Applied Nutrition and Food Chemistry Antidiabetic Food Centre), for the poster on 'Intake of a barley evening meal stimulates GLP-1 release, improves glucose tolerance and appetite regulation, and decreases the voluntary energy intake'. Their multidisciplinary research was ranked as one of the research projects where the most innovative and novel association between consumption of fibre or whole grains and health improvements was demonstrated. The *ICC awards for cereal fibre research, sponsored by Kraft Foods*, reserved to young researchers, went to Mette

Kristensen *et al.* from the University of Copenhagen, Denmark (Department of Human Nutrition, Faculty of Life Sciences) for a poster on 'Oat and barley β -glucans induce satiety and reduce energy intake – a study on acute and short-term effects' and to Rosa Montella *et al.* from the Oriental Piedmont University, Italy, for a poster on 'Determination of dietary fibre, antioxidant activity and contaminants in pearled wheat fractions as novel functional food ingredients'. These two posters showed to be innovative at the interface of cereal fibre chemistry, technology and nutrition, and proved an outstanding originality, scientific merit and outcomes of the research. The *Wiley-Blackwell Award for Dietary Fibre Research* was received by Damien Belobrajdic, from CSIRO, Australia, for a poster on 'Dietary resistant starch dose-dependently reduces adiposity in obesity-prone and -resistant male rats'. INRAN and ICC congratulated all award winners and thanked them for their valuable contribution to the success of the 5th International Dietary Fibre Conference 2012, and for making it an outstanding scientific event.

In the Closing Session, Marina Carcea and Roland Poms extended their thanks to speakers and poster presenters for their outstanding scientific contribution, and also expressed their thanks to Sponsors and Exhibitors for their support and for helping to make DF12 such a successful event. Special thanks were also given to the Organizing Committee who worked at the organization of the event round the clock for months and to the helpers who took care of the practical needs during the 3-day conference.

Roland Poms, on behalf of ICC, and Joel Abecassis, on behalf of INRA, announced the venue of the 6th Dietary Fibre Conference: Paris, France, 1–3 June 2015. They thus expressed their wish to welcome all DF12 participants to Paris as well.

Satellite events

In addition to the main Conference, two satellite workshops were organized to complement the DF12 conference: the Healthgrain Forum Workshop and the interactive workshop 'Analysis of dietary fibre'. The latter was co-organized by Megazyme International and Medallion Laboratories/General Mills, provided, in particular, an in-depth insight into the development of an integrated method for measurement of total DF, and then prompted discussions about developments in CODEX acceptance of the AOAC DF procedures, the choice of DF methods, challenges and solutions in the measurement of soluble dietary fibres.

Conference gala dinner

The Gala dinner also contributed to the unforgettable memories of the Conference. At the ‘Terrace Restaurant’ of the Boscolo Exedra-Roma Hotel, on top of a neoclassical palace, in the heart of the Eternal City, between the Baths of Diocletian and the Basilica of Santa Maria degli Angeli designed by Michelangelo, DF12 participants enjoyed the Roman night with plentiful delicious Italian food.

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