Book of Abstracts

2-4 November 2016, Barcelona / Spain

THE FOOD FACTOR I
Barcelona Conference

Established, emerging and exploratory food science and technology.

http://www.foodfactor.org
Book of Abstracts

The Food Factor I Barcelona Conference, 2-4 November 2016, Barcelona (Spain)
INTRODUCTION

This book contains a selection of the abstracts that were accepted for presentation at The Food Factor I Barcelona Conference, Established, emerging and exploratory food science and technology, which was held at the University of Barcelona, Spain, from 2 to 4 November 2016.

The first edition of this Food Factor Conference gathered around 250 participants, coming from more than 45 countries. And around 280 works were presented at the conference. This was a more than satisfactory level of attendance for this first research forum, especially in the context of a global budget constraint.

The organization called for research papers dealing with the following topics:

**Food chemistry and biochemistry**
Topics: structure and function of major and minor components (either nutrient or non-nutrient) of foods, the biochemical changes produced during handling, storage, post-harvest/mortem processing, distribution or due to domestic conditions, and their impact on nutritional, physiological, sensorial, or toxicological properties and safety; Reports on new or improved techniques or methods for addressing these topics or on the chemistry of food contacting materials. Specific areas of interest were:
- Food bioactives
- Chemistry of food additives and preservatives
- Chemical analysis for the determination of authenticity and origin of foods
- Biochemical changes in cereal grains and legumes due to postharvest conditions and treatments (storage, germination, fermentation…)
- Biochemical changes in postharvest fruits and vegetables with impact in quality
- Biochemical changes produced in the conversion of muscle into meat and fish
- Biochemistry of the biosynthesis of milk components
- Biochemical changes of the transformation of milk into dairy products
- Browning reactions in foods
- Lipid peroxidation
- Computational chemistry in food research
- Chemistry of food packaging and food-handling materials

**Food microbiology**
Topics: microorganisms that are related to human nutrition and health: those used to make foods or whose use and/or consumption can improve food production or host health; the detection, identification and quantification of those that pose a threat to food safety or quality (also applied to microbial toxins and metabolites and foodborne viruses); the study of their biology (biochemistry, ecology, genetics, physiology...); their role in various food processing methods and in food spoilage; their susceptibility to different physical or chemical agents, processing or packaging methods; or their interaction with different food chain environments and foodstuff, reports on the development and application of mathematical and computational tools in food research. Specific areas of interest were:
- Rapid detection of foodborne pathogens
- High throughput screening
- Norovirus and other viral agents in foods
- Antimicrobial/biocide resistance
- Microbial risk analysis: assessment, management and communication
- Microbiology of fermented foods and beverages
- Food defense
Food contamination
- Mycotoxins
- Intestinal microbiota and host health
- Hygienic design of food manufacturing lines
- Epidemiology of foodborne pathogens
- Spoilage of soft drinks (with increasing levels of nutrients)
- Biofilms
- Cross-contamination
- Beneficial microbes
- Food parasites
- Microbial nutrition: probiotics
- Bacterial and fungal species: Yersinia, Bacillus, Staphylococcus, Listeria, Salmonella, Escherichia coli, Vibrio, Campylobacter, Brucella, Mycobacterium, Clostridium, Streptococcus, and others; Aflatoxins and other microbial-derived toxins; Norovirus, Rotavirus, Hepatitis virus and other viral agents

**Food physics**
Topics: understanding and measurement of the physical properties of foods and their constituents: structural, rheological, textural, optical, electrical, thermodynamic, flowing, acoustic, mechanical..., how they change during processing, the relationship between the properties of their constituents (water, proteins, fats, oils, gasses, and minor constituents like vitamins and minerals) and their macroscopic properties (texture, taste, smell, colour, nutritional and health impact), or the developments of purely physical ways of treating foods, either thermal or non-thermal. Specific areas of interest are:
- Thermal modification of foods: heat-moisture treatment, annealing, microwave heating, osmotic pressure treatment ...
- Non-thermal modification of foods: ultrahigh-pressure treatments, instantaneous controlled pressure drop, high-pressure homogenizers, dynamic pulsed pressure, pulsed electric fields, freezing, thawing...
- Multiscale computer simulation and mathematical modeling of food structures
- Novel microscopy, image analysis, and characterization techniques
- Soft matter physics applied to food materials
- Colloidal structures, their interactions and relationship with food stability and overall macroscopic properties
- Modern technologies for sensory analysis
- Relationship between physical properties of food and consumer preferences

**Food analysis**
Topics: analysis of foods and their constituents (amino acids, peptides, proteins, phenolic compounds, carbohydrates, DNA fragments, vitamins, functional ingredients or nutraceuticals, toxins, pesticide and drug residues, industrial, processing and packaging contaminants, additives, allergens, antibiotics, nanoparticles,...) by the use of analytical and imaging techniques and methods, in the context of the assessment of food structure, quality, safety, traceability, origin, authenticity, health benefits of certain constituents...; works featuring the analysis of large amounts of data generated by different techniques or time series of many variables (chemometrics). Specific areas of interest were:
- Instrumental techniques: biological, separation, spectroscopic, rheological, thermal, radiochemical, electrochemical, miniaturized microfluidic systems, modern foodomics and/or systems biological approaches...
- Imaging techniques: optical, confocal, electron, atomic force microscopies...
- Analysis of sensory properties of foods
Sample preparation
- Qualitative analysis in a chemometric context
- Data pre-processing
- Calibration standards
- Hyperspectral images
- Image analysis and processing in food science and in industry
- Ingredient distribution in products
- Microstructures of foods: characterization and distribution
- E-noses and e-tongues
- Consumer behaviour

Food processing and packaging
Topics: established and novel processing and packaging technologies applied for delivering foods that last longer before spoiling (preservation), and that are available, safe, nutritious, and convenient, while minimizing environmental impact. Specific areas of interest were:
- Active and intelligent packaging
- Migration and potential health effects of packaging-associated chemicals of concern (Bisphenol-A, semicarbazide...)
- Modified atmosphere packaging
- Established and modern processing and preservation technologies: drying, cooling, freezing, heating, salting, fermentation, pasteurization, additives addition, irradiation, hurdle technology, use of high-pressure and pulsed electric field processing, dense phase carbon dioxide, ozone, ultrasonics, cold plasma, IR technologies, natural antimicrobials, oxygen depleted storage, microwave heating, low shear extrusion...
- Green technologies: supercritical fluid extraction, membrane technology, biocorrections...
- Biorefinery in the production of food components (proteins, carbohydrates, fats...)
- Dietary, health, and environmental concerns related to food processing
- Waste reduction in food processing and valorization of by-products

Food engineering and hygienic design
Topics: (hygienic) design and (safe) operation of food plants, including engineering tools for assessing and managing risks. Specific areas of interest were:
- Heat, mass transfer and fluid flow in food processing
- Artificial intelligence in food research and industry
- Mathematical modelling and software development for food research and industry
- Finding, correcting and preventing hazards in food industry: Hazard Analysis and Critical Control Point (HACCP), Microbial Risk Assessment (MRA)...

Environmental impact of food production and consumption
Topics: environmental impact of the food supply chain (carbon and water footprint, biodiversity, land use...), for each of the food groups. Specific areas of interest were:
- Food waste impact on climate, water, land and biodiversity
- Ways of reducing environmental impact
- Environmental impact of meat production

Foods of plant origin
Topics: plant, animal, crop or soil science relevant to the production of foods of plant origin: cereals, legumes, fruit and vegetables, sugar crops. Specific areas of interest were:
- Understanding phytobiomes for improved crop productivity
- Farming animal science: cattle, sheep, goats, horses, pigs, poultry
- Soil science
Sustainable farming systems
- Genetic and non-genetic crop improvement
- Plant and crop protection
- Crop models
- Improvement of water use
- Resistance to pests and disease
- Modification of crops for reducing waste
- Filling the gap between plant and crop physiology
- Stress in crops produced by changing environmental conditions

**Foods of animal origin**
Topics: animal, vegetal, soil or marine/aquatic science relevant in the production of foods of animal origin: meat, fish, milk and their derived products, eggs, insects...

The regular conference program was complemented with two Plenary Lectures:

- "Highlighting natural value: physical and chemical approaches in food processing" by Isabel C.F.R. Ferreira, from the Mountain Research Centre (CIMO), ESA, Polytechnic Institute of Bragança, Portugal
- "Nonthermal processing technologies for food: Current applications and future perspectives" by Pedro Elez-Martinez, from the University of Lleida, Spain

We hope attendants and readers in general will find the content of this book of abstracts interesting, inspiring and useful and we look forward to seeing you in another fruitful edition of the conference in 2018.

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Food chemistry and biochemistry
Are preterm human milk fortifiers good solution for preterm infants’ nutrition?

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Breast milk is the best dietary choice for infants [1]. However, preterm human milk that is not complete in its composition (nutritional and biological value), and is not appropriate food for preterm infants. There are attempts to overcome disadvantages of breastfeeding by using fortifiers in preterm human milk [2].

The paper presents the results of chemical and biochemical tests of the mature preterm milk from 30 mothers. Samples, which includes different modes of storage, were collected from a milk bank from Institute for Neonatology in Belgrade.

The results (the basic nutritional components and properties and biochemical indicators of the antioxidative capacity and PRSL) of comparative tests of the preterm milk and preterm milk with fortifiers (made in Serbia) indicate deficiencies in the composition of mature preterm milk as compared to the results obtained from the term mature breast milk, majority of which can be compensate by high-quality fortifier. Addition of fortifier satisfies the needs of preterm infants for the progress of growth.

In conclusion, the use of preterm fortifiers for human milk is good solution for wide application in relation to the nutritional needs of preterm infants. The best and promoted strategy, in order to most effectively support nutritional needs of infants would be optimization of nutritional needs of each individual preterm infant[3,4].

Keywords: preterm infants’ nutrition, preterm human milk, fortifier

References
ARE PRETERM HUMAN MILK FORTIFIERS GOOD SOLUTION FOR PRETERM INFANTS NUTRITION?

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Introduction
Breast milk is the best dietary choice for infants [1]. However, preterm human milk that is not complete in its composition (nutritional and biological value), and is not appropriate food for preterm infants. There are attempts to overcome disadvantages of breastfeeding by using fortifiers in preterm human milk [2].

The paper presents the results of chemical and biochemical tests of the mature preterm milk from 30 mothers. Samples, which includes different modes of storage, were collected from a milk bank from Institute for Neonatology in Belgrade and considered the benefits and challenges of providing human milk to premature infants, approaches to human milk fortification, and the advantages and challenges of donor milk products.

Materials and methods
Milk was collected from 30 healthy mothers of preterm infants (gestational age 28–36 weeks; birth weight 900–2470 g), within the 6 weeks after the delivery (mature milk). The mothers were asked to express milk between 8:00 and 10:00 AM. Milk was aliquoted and examined prior and after Holder pasteurization (62.5°C for 30 minutes) and/or storage at -20°C (for 7 or 30 days). This study was approved by the Ethics Committee of the Institute for Neonatology, NIH2401/4 (April 18th, 2014). Informed consent was obtained from all participants.

The FRAP assay, developed by Benzie and Strain as a direct method for measuring the total antioxidant power of biological fluids, was adopted in this study. The results were expressed as FRAP value (µM Fe(II)) of the samples.

Results
The basic nutritional components and properties and biochemical indicators of the antioxidative capacity and PRLS (potential renal solute load) of comparative tests of the preterm milk and preterm milk with fortifiers (made in Serbia) indicate deficiencies in the composition of mature preterm milk as compared to the results obtained from the term mature breast milk, majority of which can be compensate by high-quality fortifier. Addition of fortifier satisfy the needs of preterm infants for the process of growth.

Conclusions
Pasteurization and storage affect nonenzymatic and enzymatic antioxidative agents in human milk. It appears that nonenzymatic antioxidative systems in colostrum and milk are different [3]. The effects of processing may be partially compensated by fortification/spiking with ascorbate before use. Fortified human milk has tremendous benefits in improving the growth and short and long term outcomes for premature infant. Mother’s own milk has clear advantages to donor human milk both the composition and the lack of necessity for pasteurization, increased efforts to establish and maintain milk supply in women delivering preterm are likely to have greater benefits than providing pasteurized donor human milk.

Finally, the use of preterm fortifiers for human milk is good solution for wide application in relation to the nutritional needs of preterm infants. The best and promoted strategy, in order to most effectively support nutritional needs of infants would be optimization of nutritional needs of each individual preterm infant[4, 5].

Table 1. Protein, carbohydrate, fat and energy of premature breast milk (PBM) and premature breast milk with fortifier “Impamil” (PBMF) for measurements of macronutrients and PRLS

<table>
<thead>
<tr>
<th>Component</th>
<th>PBM</th>
<th>PBMF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein (g/L)</td>
<td>3.13 ± 0.14</td>
<td>3.14 ± 0.18</td>
</tr>
<tr>
<td>Carbohydrate (g/L)</td>
<td>7.62 ± 0.55</td>
<td>7.59 ± 0.42</td>
</tr>
<tr>
<td>Lipids (g/L)</td>
<td>4.12 ± 1.29</td>
<td>4.12 ± 0.81</td>
</tr>
<tr>
<td>Energy (kJ/L)</td>
<td>79 ± 7</td>
<td>69 ± 7</td>
</tr>
</tbody>
</table>

FRAP activity

Figure 1: FRAP(ferric reducing power activity) : Biochemical indicator of the antioxidative capacity in raw and pasteurized preterm breast milk and PBM with IMPAMIL Fortifier, expressed as FRAP value (µM Fe(II)) of the samples.

Acknowledgments
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References
CERTIFICATE OF ATTENDANCE

The Organizing Committee of The Food Factor I Barcelona Conference hereby declares that

Miroslav Vrvic

attended the above-mentioned Conference, which was held at the University of Barcelona (Spain) from 2 to 4 November 2016.

This certificate was issued in Barcelona (Spain) on 4 November 2016.

[Signature]

Antonio-Méndez-Vilas
Conference Chairman

[Organizer Logo]
CERTIFICATE OF WORK PRESENTATION

The Organizing Committee of The Food Factor I Barcelona Conference, which was held at the University of Barcelona (Spain) from 2 to 4 November 2016, hereby declares that

Miroslav Vrvin

presented and defended the following accepted contribution:

"Are preterm human milk fortifiers good solution for preterm infants' nutrition?"

publicly within the Scientific Program of the Conference as Poster presentation.

This certificate was issued in Barcelona (Spain) on 4 November 2016.

Antonio Méndez-Vilas
Conference Chairman

Organizer