Different considerations should be made when the analysis is focused on supplements, because in this case the potential toxic ingredient may be concentrated in the product, the intake can be more frequent, and, other ingredients present in food that would counteract toxicity can be lost. In this regard we are therefore it will be discussed case studies based on the European Food Safety Authority (EFSA) and European Medicine Agency (EMA) guidance document for the safety assessment of botanicals and botanical preparations intended for use as food supplements or drugs.

Session 5.4. Sustainable Diet I: Global Challenges

Sustainable diet within sustainable food systems

Alexandre Meybeck, FAO

"A sustainable food system (SFS) delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised" (HLPE, 2014). By this definition, the global food system is clearly not sustainable. There are more than 2 billion malnourished, almost 800 million undernourished, more than one billion overweight and obese. The majority of the hungry and poor are food producers. Food production and consumption are among the main drivers of environmental degradation threatening its own resource base. According to FAO, global food demand is projected to increase by 60% towards 2050 from 2007, driven by changing consumption patterns and population growth. Unsustainable food consumption patterns are both a result and a driver of unsustainable food systems. Sustainable diets have been defined as "those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations", combining two totally different perspectives: a nutrition perspective, focused on individuals, and a global sustainability perspective, in all its dimensions: environmental, economic and social. A case study using the Mediterranean diet has enabled to identify some methodological issues to be addressed when considering actual diets and their impacts. Dietary models can be assessed and compared with other types of diets and used as models against which to compare actual diets. Diets are conditioned by food systems; not in a single spatial homothetic relationship but rather as the result of interactions between consumers' attitude and lifestyle, food availability and accessibility, in the food system and with other systems.

Improving the sustainability of global meat and milk production

Professor Andrew Salter, Division of Nutritional Sciences, School of Biosciences, University of Nottingham, Sutton Bonington Campus, Loughborough, LE12 5RD, UK

Meat and milk represent energy-dense sources of high quality protein and essential micronutrients. While it is quite possible for humans to maintain good health on animal product- free diets, most individuals choose to be omnivorous. The last several decades have seen a marked increase in global consumption of meat and dairy products, specifically in emerging economies such as China. This demand has largely been met by improvements in farm animal breeding, nutrition and general husbandry practices. However, with the global population expected to increase by 2-3 billion by 2050, there is now growing concern over the use of large areas of arable land to grow crops for animal feed that could be used to directly produce food for human consumption. An increasing proportion of fresh water is used in animal production, both in feed production and by the animals themselves. Animal production, particularly ruminants, also significantly contributes to greenhouse gas production, and hence climate change.

A challenge for the coming decades is to find sustainable ways to meet the demand for animal products. Novel feed sources, which do not directly compete with human foods, need to be explored. The use of insects, both as animal feed and directly for human consumption, requires further consideration. Improved nutritional strategies to minimize pollution and greenhouse gas emissions are required. Conventional breeding, novel farming techniques, use of growth promoters and genetic manipulation are all likely to be further exploited, to varying extents, in different parts of the world. Overall consumption of meat and dairy products may be mitigated through the use of 'mimetics' derived from plant, fungal and algal sources. It is likely that a combination of such approaches will be required to meet future global demand for meat and dairy products.

Does globalization of agrifood systems provide sustainable nutrition?

Matin Qaim, Department of Agricultural Economics and Rural Development, Georg-August-University of Goettingen, 37073 Goettingen, Germany

I spite of recent progress in the reduction of global hunger, malnutrition remains an issue of significant magnitude. Around 800 million people are undernourished in a calorie sense; an estimated 2 billion people suffer from micronutrient malnutrition; 1.5 billion people are overweight or obese. These three forms of nutritional problems are sometimes referred to as the "triple burden of malnutrition". They are responsible for large human and economic costs. Policies and interventions to address these problems should have high priority. In addition, it is important to understand how mega-trends affect the different forms of malnutrition. One such mega-trend, which is the focus of this paper, is the observed globalization of agrifood systems. Various facets of globalizing agrifood systems are reviewed, including trends in agricultural technology, changing consumer preferences and lifestyles, vertical integration of supply chains, the proliferation of food standards, as well as modernization and concentration in the food retail sector. The effects of these trends on the triple burden of malnutrition are analyzed through a summary of empirical studies carried out in different developing countries. Globalizing agrifood systems have significant impacts on nutrition, which can be both positive and negative. For instance, the rapid expansion of supermarkets in Africa seems to increase overnutrition in adults, while reducing

undernutrition in children and adolescents. Impact pathways are explained. Modernizing food supply chains can also affect nutrition and dietary quality of rural farm households through changes in marketing opportunities, incomes, and gender roles. These findings suggest that impacts depend very much on the context. More research is needed to better understand the multi-faceted linkages between changing agrifood systems and nutrition. Such knowledge can help to guide policymaking in specific situations.

Session 5.5. Sustainable Diet II: Sustainable food consumption

The potential of food preservation to reduce food waste: the making of a food supply chain revolution

Wayne Martindale, Alan Marson, Jacek Obuchowicz* Sheffield Business School, Sheffield Hallam University, Sheffield S1 1WB*

**New Food Innovation Ltd, B29 Main Building, University of Nottingham, College Road, Sutton Bonington, Loughborough LE12 5RD*

Introduction; while we state it seems unthinkable to throw away nearly a third of the food we produce, we continue to overlook we are all very much part of this problem as consumers of meals. This has an impact on our view of what we think a sustainable meal is and our research shows food waste to be a universal function that can determine the sustainability of diets.

Objective; achieving sustainability in food systems depends on the efficiency of both culinary preparation and knowledge of foods. These are overlooked by the current food waste debate that is concerned with problems rather than solutions, using classic 'end-of-pipe' assessments to describe where and what food waste is. We aim to change this oversight.

Method/Design; working with food manufacturers has led us to understanding how consumers can reduce waste. The approach has the associated legacy of Clarence Birdseye who recognised that consumers should have 'less fuss, less smell and less waste' in preparing foods. The power of building-in sustainability messages with brands and food movements is still novel, under-utilised and our work shows the potential of doing this.

Results; we have chosen frozen food to demonstrate a model because our research shows the use of frozen foods resulted in 47% less waste.

Conclusions; this has created a step-change in how we consume foods with the #iFreeze movement working across different products and supply chains to augment behaviours associated with consuming the once ill-defined 'sustainable meal'.

Wholesome nutrition: an example for a sustainable diet

Dr. Karl von Koerber, Working Group on Sustainable Nutrition, Munich, Germany

Introduction: "Wholesome Nutrition" is a concept of sustainable nutrition that we developed in the working group of Prof. Claus Leitzmann at the University of Giessen in the 1980s. This concept gives an equal ranking to the health, ecologic, economic, social and cultural dimensions of nutrition. In 1992 at the UN-Conference of Environment and Development in Rio de Janeiro "sustainable development" embraced the dimensions "environment", "economy" and "society". In addition to these three "classical" dimensions of sustainability, we had included "health" as the fourth dimension because nutrition has far reaching effects on human health. The fifth dimension "culture" is now established in the sustainability discussion since the respective cultural background determines food habits. In 2005 the "New Nutrition Science Project", as an initiative of IUNS and the World Health Policy Forum, initiated a new direction in nutrition science: the biological focus has to be extended by an environmental and social focus.

Objectives: Presently mankind has to cope with huge global challenges: poverty and food insecurity in developing countries, uneven use of resources, climate change, insufficient access to clean water, soil degradation, loss of biodiversity etc. After analyzing the global studies of these topics in the different dimensions of sustainability, the objective is to identify opportunities for action to respond to the global challenges.

Results: The concept of "Sustainable Nutrition" analyses the food supply chain in all its stages from input-production, primary production over processing, distribution, preparation, and food consumption to waste disposal. The analysis results in the following seven principles:

(1) preference of plant products,
(2) organically produced foods,
(3) regional and seasonal products,
(4) preference of minimally processed foods,
(5) fair trade products,
(6) resource saving housekeeping and
(7) delicious meals.

Conclusions: The concept on "Sustainable Nutrition" is based on holistic thinking and has the potential to reduce some of the global challenges in the field of nutrition. Scientists, stakeholders, multipliers and consumers are called to include the dimensions of environment, economy, society and culture - additionally to the biological/health aspects.

Organic food consumers profiles from the large Nutrinet cohort follow-up in France

Emmanuelle Kesse-Guyot; Affiliation : Nutritional Epidemiologist, INRA, Sorbonne Paris Cité University. France

In developed countries, the expansion of the organic food market is growing concomitantly with an increase in concerns of consumers for food quality and safety.

However, little is known about the association between dietary characteristics and amount of organic food consumed.

One aim of the Bionutrinet project is to extensively describe organic food consumption profiles and to address whether an organic

based diet is related to healthy dietary behaviors and better adherence to dietary guidelines and nutrient adequacy.

Conventional and organic food intakes, as well as the share of organic food in the diet were obtained using a specifically developed 264 items - organic food frequency questionnaire focusing on the past year among 28,245 adults (71% of women), participants of the NutriNet-Santé cohort study. All data were weighted using national census reports.

Weighted quintiles of the contribution of organic foods to the overall diet were computed. Diet quality was estimated using two scores reflecting adherence to dietary components of the Programme National Nutrition Santé-Guidelines (mPNNS-GS) and the probability of adequate nutrient intake (PANdiet). Relationships between levels of organic food consumption (defined as the contribution of organic foods in the whole diet) and dietary intakes and diet quality scores were assessed using multivariate linear regression.

The percentage of non-consumers of organic foods was 8.4% in women and 14.7% in men.

More than ¼ of organic food consumers reported eating at least 50% of vegetables, fruits and related products, from organic sources.

Organic foods contributed to 20% to the whole diet among women and 18% among ($p<0.0001$). When excluding the liquid products and the water in particular, corresponding proportions were 28% among women and 25% among men.

Overall, individuals with higher education level, never smoker, older subjects (i.e. above the median value equals to 48 years old) and vegetarians/vegans had higher intake of organic food (g/day) than their counterparts.

Intakes of plant foods (including vegetables, fruits, whole grain products and nuts) increased along with the contribution of organic foods in the diet while it was the reverse trend for milk, dairy products, cookies and soda. No relationship was found between sweet product consumption and levels of organic food consumption.

The diet quality scores increased from the first quintile (mPNNSGS: 7.89±0.02; PANDiet: 64.49±0.09) to heavy consumers (mPNNSGS 8.78±0.02; PANDiet: 69.26±0.09). However, regarding individual components of the mPNNS-GS, the percentages of individuals following the nutritional guidelines for added fat decreased along with the increase of the contribution of the organic foods (82.13% to 68.42%).

Our study provides new insights into the understanding of organic food as a determinant of dietary intake and sheds some light on the dietary profiles of intermediate organic food consumers who are probably the main stakeholders in the transition toward sustainable consumption.

Session 5.6. Food innovations

Novel food and health infrastructures in Europe

Krijn J. Poppe, Karin Zimmermann, Pieter van 't Veer on behalf of the EuroDISH consortium, Wageningen UR

Europe is facing major challenges in promoting health and reducing the disease burden of non-communicable diseases such as cardiovascular disease, cancer, and type 2 diabetes – related to food, nutrition and lifestyle. Through public health nutrition strategies with policy interventions, product reformulations, communication campaigns, etc. public and private stakeholders contribute to the promotion of a healthier lifestyle. Such actions have to be evidence-based and high quality research is vital.

Objectives and design

In the FP7 EuroDISH research project recommendations were developed on the needs for food and health research infrastructures. The work was organised around the 'DISH' model, the four key building blocks of food and health research:

- Determinants of dietary behaviour - finding out why we choose what we eat and drink
- Intake of foods and nutrients – assessing and evaluating how much we eat and drink
- Status and function of the body - using markers of body stores, biomolecular mechanisms, nutritional health
- Health and disease - assessing the links between nutrition and health outcomes (diseases, quality of life, ageing, fertility).

The project mapped existing research infrastructures and identified gaps, needs and governance issues. It integrated the findings and developed a conceptual design with a roadmap for implementation.

Results

There is a need for one European research infrastructure ('DISH-RI') that is specific for food in relation to nutrition and health and that overarches the DISH disciplines:

- Researchers need an overarching research infrastructure that fills important gaps and overcomes fragmentation to enable cutting edge research.
- Policy makers need more scientific insights on how to change the food environment and prevent further cost increases of diet related diseases.
- Food industry needs scientific insights to foster product innovation and strengthen its competitive position.
- Societal organisations and practice professionals need a solid evidence base for their strategies and advice.

Food bioactives and health claims

Paul A Kroon, Food and Health Programme, Institute of Food Research, Norwich Research Park, Norwich NR4 7UA, United Kingdom.

Cardiovascular disease is the biggest cause of morbidity and mortality in Europe and is a major target of national programmes towards healthier diets and a driver of innovation in the food industry. There is a clear need and a substantial market opportunity for develop-ing new foods and beverages that have proven benefits for CV health. The potential for dietary bioactives to deliver beneficial effects in humans has already been established; e.g. polyunsaturated fatty acids and plant sterols have proven health benefits and several health claims have been approved by the European Food Safety Authority (EFSA).

Pre-clinical research with bioactive peptides and polyphenols reported over the past 20 years has demonstrated that they possess real potential in terms of exerting beneficial physiological effects on