Integrating Safety and Nutrition Research along the Food Chain: The New Challenge

Lille, October 27, 28 and 29, 2004

Intermediate report of the parallel sessions
Project IRFOS (SSA FP6-2002-FOOD-1-506261)

Aims of the Conference

Review the results of 5th and 6th Framework Programmes (FP) in the field of Food Quality and Safety.
Contribute to the preparation of the next call for proposals of the FP6.
Provide recommendations for the building up of the FP7

Towards FP7

- Suggestions for the FP7 planning procedure based on experiences from FP5 and FP6
- Consult the stakeholders in a resource friendly manner (short EoIs!)

Session 1: Microbiological risks in the food chain: bacteria, viruses, parasites…

Chairpersons: Servé Notermans, TNO (The Netherlands) & Walter Hammes, University of Hohenheim (Germany)
EC Project Officer: John Claxton

Gaps in research

- Microbiological risk assessment and data gaps on exposure assessment (lack of data for proper risk assessment and limited availability of food consumption data, food preparation data, food contamination data, infection/morbidity data or complete surveillance data)
- Communication of special issues with fresh products (including organics) to the public
- Microbiology of surfaces and within solid matrices (models for inactivating micro-organisms, decontamination of micro-organisms including "novel" agents such as prions and parasites, growth models, worst case scenarios in order to produce best-indications for model). This should include not only growth of the organism but also toxin production.
- Ecological aspects of micro-organisms using new tools (gut flora, buffering, interaction with other organisms, influence of the micro-environment)
- Proper risk assessment for antibiotic resistance of organisms used in the food chain at various steps
- TSE diagnosis *in vivo*
- Improved food borne disease statistics, based on laboratory studies and surveillance

Expected evolution

- Guidelines and basic information for their preparation, for agricultural practices, including organics. Includes evaluating incentives/disincentives for compliance, prevention of contamination and possibly should include monitoring.
- Attention to contamination in fresh produce, e.g. the influence of the surface on contamination/decontamination, including decontamination during processing. Includes a need for new technologies.
- Exploitation of beneficial micro-organisms e.g. for the prevention of allergies and new food risks

Emerging challenges

- Cost effectiveness of achieving and monitoring effective hygiene (biosecurity) e.g. the prevention of pathogen contamination in livestock and the food chain and data/models for the optimisation of safety.
- Need to use the potential of new tools, especially "-omics" tools in microbiologically safe food production, but define the limitations. Also important in areas other than directly in the food chain.
- Research on consumer perceptions is needed to really address food safety problems in the most effective manner. Increased interaction between "hard" and social sciences needed.
- Consumer behavioural changes may create novel risks (e.g. eating fresh products in the absence of decontamination technology such as mild products lacking acidity, salt etc)

Emerging issues

- New emergent pathogens
- Involvement of further bacterial species (sub-species, types etc) in disease
- Virulence/immunity against emerging pathogens, including in special risk groups
- Conclude on whether key impact of, e.g. Johne's with Crohn's, is on animal welfare/health or food borne disease.

- Address potential conflicts between animal welfare trends and associated food risks. Look at multi-criteria systems such as impact of housing/production systems on food borne pathogens

Emerging risks

- Development of new products, changes in technology and society, causing changes to organisms (e.g. the effect of world-wide trade, travel etc on production of new organisms, resistant organisms, susceptible human populations etc).

Areas for continuation

- Consumer communication/education for understanding of the complexity of food safety and perception of new technologies (food technology and animal production). Also implementation of “good practice”, such as not using/abusing of antibiotics.

Session 2: Chemical risks in the food chain: contaminants, ingredients and additives, novel foods…

Chairpersons: Ib Knudsen, DVFV (Denmark) & Robert Kroes, IRAS (The Netherlands)
EC Project Officer: Dyanne Bennink, Research Directorate-General

Gaps in current R&D and science

Promote the science based risk management strategies in a European and global perspective
Integrated framework for risk assessment

- Risk-benefit assessment methodologies/comparisons/ ranking of risks (health, economy, societal perspectives)
- Probabilistic assessment of exposure and effects

Proactive safety assessment of new food sources, production/processing technologies

- Functional foods
- Herbal remedies
- Organic foods
- Methods for sustainable production of safe foods

Knowledge transfer to the primary producers, in particular in 3rd countries and to end users
Combination toxicology

- Common approaches at a global scale

Endocrine disrupters (exposure assessment, integrated epidemiological studies taking into account combined exposures and relevant health end points, hormesis, newly emerging polar compounds)

Expected evolutions in our society

- New member states to be actively involved in European projects (cross fertilisation)
- Communication of increasingly importance at all levels
- Aging populations becomes a more prominent European problem as well as age and food related diseases
- Personalised diet
- Methodologies for detection of food allergies
- Other health issues
- Global management of food/feed safety problems
- Economic driving forces hampering the decontamination of food

Emerging challenges and issues

Merge of toxicological and nutritional approaches to tackle the health problems of tomorrows' food
Lifestyle changes and changes of risk

- Safe food for developing countries: capacity building, new role of Europe?
- Development of scientific approaches to pre-market assessment of novel foods
- Creating a platform for integrating food safety and environmental safety issues

Life style changes, including out-of-home eating and convenience food

- Strategy for the safe handling of food plants with new traits developed for non-food usage
- More focus on food ingredients of unknown nutritional value in food
- The influence of the food matrix on the bioavailability of nutrients and chemicals at large
- Food as an overarching cause for cancer, cardiovascular diseases, diabetes – and obesity should be studied in an integrated manner

Regulation of appetite based upon food ingredients
Involvement of third world countries in EU-projects
Food as a target for bioterrorism
Bioassays for multiple chemical contaminants
Databases sharing, harmonising acquisition and filing of data and cooperative merging of different databases:

- Food consumption
- Analytical data

- Disease pattern
- Etc.

Migration from packaging material
Improved biomarkers of exposure and effects
Improvement of communication strategies
High trough-put methodologies related to analysis, assessment, production and distribution
Fate of pharmaceutical residues in food and environment
Characterisation and identification of subsets of the population at risk (genetic polymorphism, gender, age etc.)
Capacity building and education at large:

- Risk managers
- Risk assessors
- Nutritoxicologists
- Stakeholders from table-to-stable

Areas needing to be continued

- Necessity for continuity between the subsequent framework programmes is stressed, and where relevant possibilities to expand research programmes above 5 years should be considered to keep expertise in place

Towards FP7

Suggestions for the FP7 planning procedure based on experiences from FP5 and FP6
Consult the stakeholders in a resource friendly manner (short EoIs!)

Session 3: Nutritional benefits and risk communication in the food chain.

Chairpersons: Ambroise Martin, Université Claude Bernard Lyon (France) & Beate Kettlitz, BEUC (Belgium)
EC Project Officer: Isabelle de Froidmont

Gaps in current R&D and science

Health claims
- Harmonisation of scientific substantiation of health claims on foods
- Research into the role and development of nutritional profiles as criteria for making nutrition or health claims or for the fortification of food

Communication (risk – benefits)
- How to improve risk communication;
- Study the impact of communication; perceived risks and benefits, who is the communicator; taking into consideration different types of consumers

Methods
- Development of methods to analyse interactions between cells and bacteria or vice versa

Sociology
- Understanding the influences on consumer food and diet behaviour and food choice
- How to get consumers to choose healthy diets
- How to organise strategic stakeholder dialogue to implement corporate social responsibility

Diet
- Feasibility of setting nutritional targets;
- Multi stakeholder concerted actions in relation to food safety and/or nutrition
- Research into changing pattern of food intake and its impact on public health to develop strategies to influence nutrition education, nutrition campaigns
- Mapping food culture in Europe
- Further analysis of the information contained in databanks to include newly derived information on contaminates/allergens, food supplements, enriched food , nutrient availability, etc
- Robust intervention trial data on the relationship between whole diet and major health issues
- Mechanisms extrapolation of in vitro studies into humans, if the mechanisms are not known

Nutrition related diseases
- Influence of changing dietary patterns, lifestyles and the development of non communicable diseases
- E.g; gluten containing cereal consumption during childhood and development of gluten intolerance and celiac disease

(new)Technologies
- More efforts in gaining public trust in biotechnology
- Further development and standardisation of current transcriptome, proteome and metabolome technologies and technologies to assess genetic polymorphisms within the frame of genomics technology.
- Development of bioinformatics for nutrigenomics data interpretation.
- Novel processing and adaptation of micro organisms in terms of food quality and risk
- Selection of new wild type bacteria for production of food components
- Technical barriers for solving nutrition needs.

Expected evolutions in our society

Increased consumer awareness/concerns of food and health
More foods adapted to the needs of different groups of population on the market
Diet
- Changing in population characteristics, i.e. older population with more risk of non-communicable diseases

- Possible increase of inflammatory diseases e.g.; Crohn's diseases, or multiple sclerosis, Arthritis…..(effects of some microbiological strains: pro-inflammation)
- Development of food intolerances having an influence on psychological developments of children or elderly

Possible evolutions

- The society with not have enough money, therefore looking for simple, not too costly solutions
- The society with all the money needed therefore looking into most sophisticated solutions to solve diet related health problems – personalised diet
- The society looking for the magic pill (means people do not care and look for food supplements that they believe will solve all problems. - Food substituting medicines?

Emerging challenges

Diet

- Risk-benefit analysis of food
- Increasing obesity rates with increasing diet- related non-communicable diseases; therefore research into: how to combat obesity and diet related diseases;

Communication

- Impact of claims and labelling on food choices and consequently on changing diets
- How to communicate nutritional advice in a way that it is attractive and convincing for consumers which are primarily ignorant

Sociology

- Develop sociological research on expertise and the process of risk assessment itself: it is one of the mean to ensure that the only remaining uncertainty in the result of assessment is due to the gaps in knowledge

Food development

- Development of food products and food processes that will benefit third world countries

(Re-)emerging issues, new themes

Functional food

- Nutritional safety
- Interaction of food and drugs
- Brain function and appetite
- Non invasive techniques /markers to measure large populations

Communication

- Estimate how many people will be negatively affected by preventing healthy diets due to perceived risk as communicated in media

Emerging risks

- Transmission of new pathogens

Areas needing to be continued

Biomarker research and validation of biomarkers against endpoint

- Determinants of obesity

Research on relation food and mental performance
Nutritional intakes and requirements
Bridging the gap between scientists and consumers

- Research into consumer behaviour, understanding of food related topics

Other comments

Return of some kind of "cell factory" research program in relation to food and/or pharma production
Linking projects from different key actions, e.g. biological hazards, contaminants with nutrition projects
Addition of new partner to projects with no additional funding
To ensure network durability following the end of EU funding
Linking research work and regulatory work at all stages

Session 4: Detection and traceability in the food chain.

Chairpersons: Holst-Jensen Arne, National Veterinary Institute (Norway) & Hub Noteborn, VWA (The Netherlands)
EC Project Officer: Paul Vossen

Gaps in current R&D and science

1. Dissemination of gathered data, providing data bases after projects finish
2. Databases on food intake

Technical
- Detection
- Lab-on-a-chip (microsystems, miniaturisation)
- Multi-analyte detection of different types of hazards, e.g. mycotoxins
- Methods for verification of organic food
- Development of selection, breeding and marker assisted breeding methods to adapt crop and livestock to the needs of low input production
- Traceability
- Technology to provide open access to traceability info

Scientific
- Safety

Cost-benefit
- Studies of complex interactions biotic-biotic, biotic-abiotic, on genetics, genetic diversity, biodiversity, function
- Measurements in the field of traceability and coexistence, long distance dispersal monitoring
- Safety of nanoparticles (toxicology) taking into account different pathways (inhaled, digested, through skin)
- Long term research (5-10, or more years), e.g. studies of long-term health effects In situ analysis
- Fate of consumed DNA (exposure and uptake)
- Need to open the traceability domain to other supply chains (two-way dialogue with other industrial branches); Can learn from other production sectors like transportation, logistics, RFID and technology for identification.
- Knowledge of added costs from e.g. GMO to food testing (size, responsibility,…)

Expected evolutions in our society

Technical
- Increasing sensibility against microflora/ degenerated immune systems
- Nanotechnology will change most sectors in next 10 years, also large impact on food industry
- Consumer access to traceability info at home and at retail
- Global traceability linked to a central infrastructure

Scientific
- Necessity of more validated analytical tools
- Significantly higher sensitivity and perceptions to natural toxins and contaminants
- Increased demands for: foods with higher nutritional and sensory quality, personalised diets, clearer and simple labelling, and foods from organic and non-pesticide type production systems

Scientific
- Increased importance of processed foods
- Level and need of harmonisation will increase – but not necessarily implemented
- Decreased diversity in diets
- Regulation more transparent/ accessible
- Increasing consumer awareness of: environment and sustainability, and food security

Socio-economic
- Increased lawsuits against food and feed companies

Emerging challenges

Technical
- Fast physical, chemical, on-line and on-site, etc. analytic systems

- Unknown additives and GMOs, how to identify?
- Validation of multiplex technologies, e.g. multiplex PCR, array technologies, etc.

Scientific
- Establish technological competence (close gap between Europe and rest of world)
- Traceability information (origin, processes, distribution chain, etc.) will be available in the shops, restaurants, www…
- Non-verifiable claims about the food origin
- Define lowest desirable limits of detection and quantitation
- Develop local high-value-added products capable of competing with low cost foods
- Nutrition effects on health (obesity, GM effects, organic food, healthier?)
- Maintaining / improving nutritional/sensory quality
- Crop protection with lower use of pesticides
- Maintenance of food safety in low input systems

Socio-economic
- How to preserve the widest food diversity while using globally implemented procedures
- Companies fear consumer attention in relation to GM traceability

Identification of food product vulnerabilities
- How to optimally benefit from results in nanoscience, biotechnology and other new technologies in food industry, avoid negative nanoperception (cf. GMO)
- GMO explosion; avoid increasing the scare from GM foods to other areas Awareness of the population (see previous slide)
- How to deal with customers (customer relationship to be managed)
- Decision support tools for consumers
- Selecting the best areas for resource investments
- Who will consumers trust?

(Re-)emerging issues, new themes

Technical
- Bio-nanotechnology for healthier foods
- Nanotech: small sensors - broad spectra
- Non-invasive, e.g. imaging techniques for food control
- New methods of production and preservation
- Mycotoxin contamination in low input systems

Scientific
- Integration of detection technologies
- Nanotech in combination with genomics/proteomics… for sensing and detection (food safety and process control)
- Antioxidant/flavonoids/vitamin contents in food
- Antibiotic resistance in livestock production
- Need for reproducibility, develop different approaches to validate previous assumptions
- Standardisation of measurements and interpretation
- Recycling of organic wastes in agriculture
- Overall requirements, design of traceability infrastructure

Standardisation of request/response scheme
- Reference material availability, e.g. GMO authorised outside Europe

Socio-economic
- Non-proprietary implementation projects, sectors and chains
- Integration of projects between chains/harmonisation
- Batch size, identification, quantification
- ID-carriers, RF-ID, etc. transborders, numbering series
- Gaps between science and GMO legislation, e.g. the units of measurement to be clarified, how to distinguish gene stacks from parental events, how to implement acceptance of taxonomic impurity in analytical control plans?
- Ethical problems related to safety testing (facing out animal tests)
- Consumer requirements and response to traceability information.
- Privacy and information access in normal and exceptional instances in context of traceability
- Efficiency of low input systems

- Learning from experiences

Environmental impact
- Implementation projects
- Stakeholders to become more informed - Communicate expectations to analytical labs

Emerging risks

Technical
- Allergens. Need for detection systems (DNA- and protein- based and LC-MS)
- GMO contamination of crops with plants in centres of diversity
- Unauthorised and unknown GMO

Scientific
- Reliability of regulation

Socio-economic
- Significant decrease in use of preservatives may lead microbial spoilage problems in the whole food chain
- Effects of digested nanoparticles
- What are the risks of products of nanotechnology when they become part of the food?
- Chemicals added to foods, environmental factors (radiation) that appeal consumers
- Microbial aerosols (exposure and home environment)
- Toxins in spores, impact on health
- GMO contamination in low input food
- Deliberate contamination of products, bioterrorism, appropriate analytical methods
- Traceability in organic/low input systems
- Training / re-training of producers and processors for low input systems
- Efficiency of standards – linked to explosion of new products
- Rapidity in decision taking

Areas needing to be continued

Technical
- Reliable quantitation methods (real-time PCR)
- Traceability by minerals & isotopes
- Biosensors based on receptors for toxins and dangerous compounds
- Cloning of target sequences for method development, validation and to be used as reference materials

Scientific
- Natural contaminants – emerging toxins
- Support to improve the quality and safety and production efficiency in organic and low input systems
- Eggs as specific production system: quality in new production systems, in pharmaceutical industry, and isolates in nutrition (human/animal)
- Preventive measures to avoid harmful contamination, e.g. biotoxins

Socio-economic
- Support for applied economic R&D
- Consumer confidence in food (new/improvements of methods to authenticate food, e.g. organic/low input food)

Other comments

FP and EC related
- Involve more SMEs
- Co-construction with the EC during negotiations means that science is not always the end product although it is the proposal
- Simplify submission system for proposals

Scientific
- Traceability definition…(cf. ISO definition)
- Much emphasis should be made to encourage collaboration between groups working in the area of biotechnology and applied low input production systems
- Efficiency of use of nutrients like N and P

- Biotic stress (disease and pest resistance and weed competition)
- Quality characteristics (higher vitamin, antioxidant , etc. content)
- Improve concept of risk analysis in a continuous way
- Should traceability in the positive sense (added value) be distinguished from traceability in the negative sense (detection of fraud, contaminants, enforcement)
- Realistic and safe decontamination procedures
- Simulation substitute for data collections?

Socio-economic

- Detection and traceability must be at an economic price for all stakeholders
- Access to sensitive data belonging to private companies, e.g. new GMO and fraud cases in organic production
- Setting lower and lower thresholds has impact on third world countries
- Prioritise technologies that could give EU based advantages
- Definition of objectives and policies. There are no clear-cut approach = black boxes