

### **Results :**

*The objective of this work package is to evaluate the existing food production, to identify critical points presenting weaknesses concerning the control of food safety and quality and to consider concepts for the improvement of existing or the implementation of new technologies.*

**Safety and quality characteristics** of different food categories have been analysed and described. This provides a basis for transparency evaluation within the food chain. Single processing steps ranging from the raw material production to the consumption of the final products have been considered in order to emphasize the complexity of the food chain including the different interdependencies of key actors. The undertaken analysis presents a fundamental data collection.

**Improvement strategies** (best practice examples) related to food quality and safety have been analysed and identified as important tools in order to enhance transparency. Benefits in terms of their industrial application have been pointed out.

**Emerging technologies** have been analysed and compared to traditional food processing. Deficiencies within traditional food preservation processes have been revealed exemplarily. Opportunities through process optimization as well as advantages of non-thermal preservation methods have been analysed. The requirement for the establishment of performance specifications/indicators was pointed out in order to improve transparency and to facilitate industrial implementation.

**Critical research needs and priorities** with relevance for food safety and quality concerns and for improvements in food chain transparency have been specified.

In detail, the following progresses have been made:

- Key players and major product categories have been identified and the working group was established with input from external experts in distinct areas providing information on different product categories and processing steps.
- Process descriptions, product specifications as well as regulatory documents have been reviewed in order to develop a first evaluation of food quality and safety related steps in the production chain and their contribution towards transparency.
- Food safety along the food production chain was assessed by segmenting the food supply into plant- and animal- derived, raw materials, and following their progress until retail and consumption, the major elements of food safety were tracked and traced. From this the major issues related to food safety were presented and discussed. The major hazards and risks associated in primary plant and animal production and their corresponding transformation phases were presented and discussed succinctly. The role of persistent (unaltered by processing) chemical contamination from primary production, the introduction of pathogens in animal production and their modulation through processing, the introduction of potential new hazards from food contact packaging materials were analysed and described in detail. The manner in which discipline is exerted in the food chain and the role of commercial and public bodies on this was discussed
- Definitions of food quality from different perspectives (raw material supplier, producer, consumers) have been reviewed and major differences were identified with regard to relevant food characteristics as well as different levels of complexity in order to achieve a certain level of fulfilment of quality related expectations.

The following categories have been established in order to evaluate food quality:

Sensorial quality, chemical/nutritional quality, physiological quality, contaminants, microbiological quality and analysis of relevant analytical methods and standards, impact factors, related steps of the food chain as well as quality assessment options.

The following main product categories were considered:

Beverages, cereals, dairy products, fresh cut fruits and vegetables and raw pork meat. In order to categorize relevant food quality parameters, a first attempt was made to define distinct domains of transparency such as raw material, storage, food processing, food composition, analytical methods, food packaging, management systems, certification systems and monitoring systems.

- The multi-step nature of the food chain as well as the complex interactions between and within the different steps represents the most challenging issue when it comes to the transfer of food quality information along the chain. In addition, the type, quantity and reliability of food analytical tools was identified as a critical point and selected best practice examples such as the application of RFID or non-destructive methods for quality determination were analysed. Their potential to improve transparency within the food chain was pointed out but further need for their implementation in the different sectors of the food chain was highlighted.

Transparency evaluation of emerging technologies:

The emerging food processing technologies high pressure, pulsed electric fields, ultrasound and cold plasma were shown to provide the potential to overcome limitations of traditional food processing. However, available information on these technologies and their impact on food quality and safety and related consumer acceptance were identified as weak points regarding the transparency level.

As a result of the analysis of the aforementioned aspect the following **research needs and priorities** (selected examples) have been identified:

- collaborative research between different disciplines: The complex structure of the food chain requires a higher level of integration of research from different disciplines.
- re-evaluation of traditional (as well as emerging) food processing methods: Novel foods need to undergo an intensive evaluation regarding toxicological risks etc. none of the existing traditional foods had to undergo such an evaluation and certain critical points e.g. acrylamide are revealed accidentally.
- re-evaluation of analytical methods: Principles and detection limits need to be adapted to current needs.
- re-evaluation of standards and specifications: Applicability of quality definitions to new products, most product characteristics have been developed based on traditional product specifications and may not apply for products processed by emerging technologies
- synchronized process assessment for emerging technologies: Development of process performance criteria and indicators, standardization of process parameters.
- retailer impact on product quality and safety: e.g. cold chain maintenance in supermarkets, impact of consumer behavior.
- post-shopping technology and food preparation at home as part of the chain: Point of sale and point of use impact on food quality needs to be taken into account.
- information flow and communication along the chain: Compatibility between different technologies, management systems and quality standards; transfer of relevant data.
- consumer communication: Acceptance of new technologies, benefit and risk assessment.
- consumer views on emerging risks: how the consumer can accept some degree of new risk without losing confidence in the chain.
- foresight and scenario studies with experts and modelling approaches: identify and prioritise potential hotspots of emergence in the food chain.

- create mechanisms to rapidly commission research to anticipate potential risks and to catch new risks before their potential consequences are felt.
- research to address the problem that many jobs in retail and foodservice are unskilled and poorly paid and yet critical to food safety: Maintenance of adequate levels of consumer protection under circumstances of high levels of staff turnover, low skills and low wages.

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