# Keeping Food Integrity in our Agenda

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**Institutul Național de Cercetare Dezvoltare** pentru Bioresurse Alimentare - **IBA București**

# Institutul **Național de Cercetare Dezvoltare** pentru Bioresurse Alimentare - **IBA București**

## Mission

- To meet societal challenges through elaboration, exploitation and dissemination of knowledge by research, education and services in agrofood field;
- To increase quality of life and wellbeing of people by healthy food and increasing employability on the food chain;
- To have a strong connection with industry and society and to support national policies;
- To increase the Romanian research competence in the agrofood field.

## Vision

- To be a pol of excellence in the field at national level and to be part of international scientific community;
- To be trustful partner of Romanian food industry;
- To cover as much as possible R&D&I needs in the field;
- To develop high quality food, safe and by sustainable production;
- To promote healthy food and life style;
- To be an authorized voice, at national level, concerning food and food production.

# IBA's Research Directions

**Food safety: food preservation, food contaminants, food packaging**

Detecting and reducing the level of food contaminants (chemical and microbiological);
Food authenticity (quality and origin);
Food microecology;
Innovative preservation methods.

**Consumer sciences**

Understanding the attitude of consumers related to food choices;
Understanding the Romanian consumer behaviour;
Identify the determinants of food to be chosen as part of diet;
Relation between consumer and food market availability;
Relation about labelling and health and nutrition claims.

**Food nutrition: influence of diet on health, food intolerance (coeliac disease and phenylketonuria), healthy food.**

New food matrixes improved in bioactive compounds for different consumers categories and improved sensorial attributes;
Functional food;
Understanding the role of whole meal in health and well-being.

**Food (bio)technologies.**

The influence of technology and food matrix in nutrients bioavailability;
Ecological food technologies;
Decreasing the level of additives in food;
Mild food technologies keeping the initial level of nutrients in raw materials;
Clean technologies;
Technologies with low energy consumption;
Increase the diversity of vegetal raw materials in food.

## Activities:

1. Fundamental research;
2. Applied research;
3. Development;
4. Innovation;
5. Food supplements notifying/survey/control;
6. Laboratory accredited tests for industry, authorities and research;
7. Consultancy;
8. Technical assistance;
9. Professional training;
10. Competences evaluation;
11. Proficiency tests;
12. Technological demonstrations;
13. Food product.

## Departments:

Nutrition
Food Chemistry
Colloidal Biochemistry
Food Packaging
Microbiology-Elisa
Molecular Biology
RMN
Senzorial Analysis
Chromatography
Interdisciplinary Research
National Service for Aromatic and Medicinal Plants and Bee Products
Human Resources Development
Pilot plants for cereal, meat and fruit and vegetable processing




## The consumer expects that food

- is fresh, however able to be stored for long period
- looks and tastes good, but is as natural as possible
- is not expensive (affordable/cheap)
- is safe

## Legislation to protect the consumer

Safety Aspects

- Protect the health of the Consumer
- Ensure the implementation of maximum limits

Quality Aspects

- Ensure correct labelling
- Detection and prevention of frauds

In general, the current context for food consumers' decision process is characterised by:

- **Health concerns**, as dietary habits play an important role in keeping optimal health and preventing a series of illness (WHO, 2009);
- **A high degree of consumer interest and awareness of environmental issues.** This is confirmed, for example, in the 2009 Eurobarometer survey which indicated that more than 8 out of 10 Europeans felt that a product's environmental impact was an important factor in deciding which products to buy (Eurobarometer, 2009);
- **Confusing messages being sent about food**, especially when a food safety crisis occurs, erode consumers trust in the food industry and public authorities; in turn, consumers are coming up with new rules and strategies for what they will and won't eat — and, as a result, their relationship with food is changing.

Source: Papadopoulos et al.,2012, van Rijswijk, Frewer, 2008; Eden et al., 2008; Lobb et al., 2007; Halkier et al, 2007; Beulens et al., 2005

# Food integrity definition

- **Food Integrity** = the state of being whole, entire, or undiminished or in perfect condition, in term of quantity and quality (hygienic, nutritive, sensorial);
- Providing assurance to consumers and other stakeholders about the safety, authenticity and quality of European food (integrity) is of prime importance in adding value to the European Agri-food economy.

(https://secure.fera.defra.gov.uk/foodintegrity/index.cfm)

# Food chain integrity

- Food chain integrity is multi-disciplinary, based on microbial and chemical food safety, authenticity of origin, fraud and quality, covering all aspects of the food chain from producers to consumers.

- As future consumers will demand food that is not only safe, healthy and tasty, but also, sustainable, animal welfare, correct labour (free of child labour) so on,

- Research is needed to convert these subjective perceptions into quantitative and objective criteria in order to produce foods of high integrity.

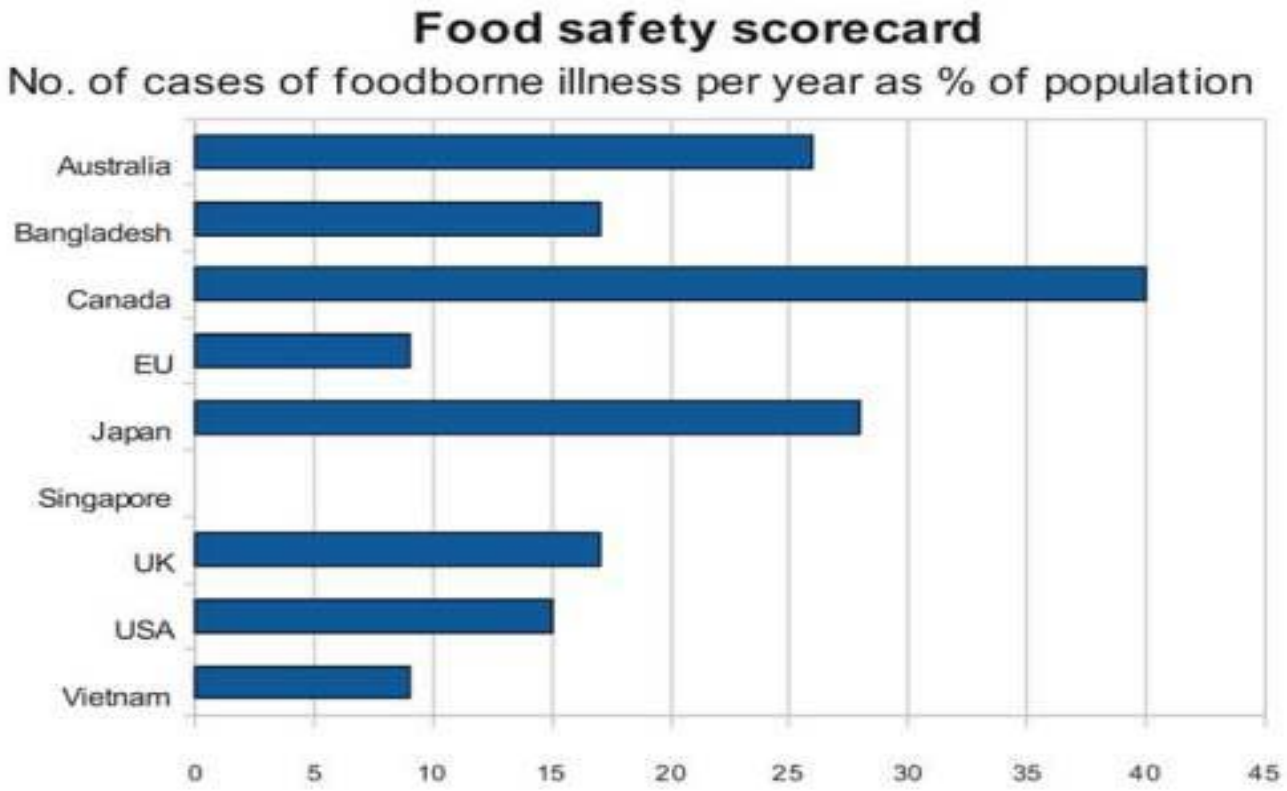
Source: J. Hoorfar, R. Pruggerl, F. Butler, K. Jordan, *Food Chain Integrity*, *2011*, *Pages 303-308, Future trends in food chain integrity*

# Food Safety: Where now?

- Food safety is not negotiable: health, social & economic reasons
- Maintaining a safe food supply chain is a very complex task. Food safety costs money, whether it works or not
- Food borne diseases still represent a considerable public health burden in the world
- Food safety crises are not a thing of the past
- The integrity of European foods is under constant threat from fraudulently labelled imitations that try to exploit that added value.

- Historically, food scares have been with human beings for many years.
- Atkins (2008) has discussed that, in Europe, food scares (especially zonotic hazards) have been with the society of UK (for example) for at least 150 years.
- Saltini and Akkerman (2012) mentioned that only in Europe food borne illness affects about 1% of population (approx. 7 million people) each year.
- Only in 2011, approximately 16.7% of population (47.8 million people) got sick in America in relation to food related illness (Resende-Filho and Hurley, 2012).

# Overall, EU ranks well in food safety



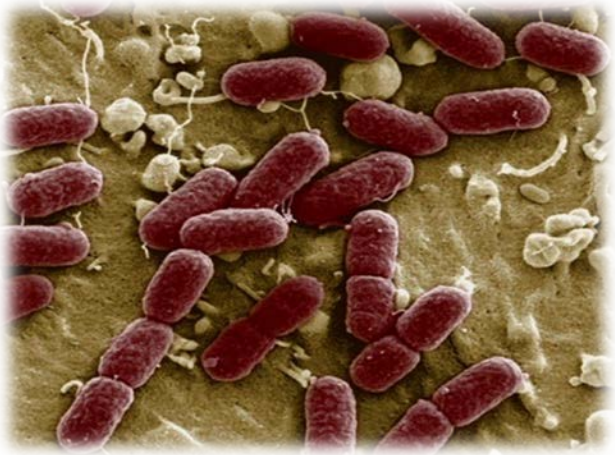

http://foodfreedom.wordpress.com

# Food crises

- Food scandals related to adulteration and fraud have put food authenticity as part of total food quality and safety
  - The tools to control both are essentially the same



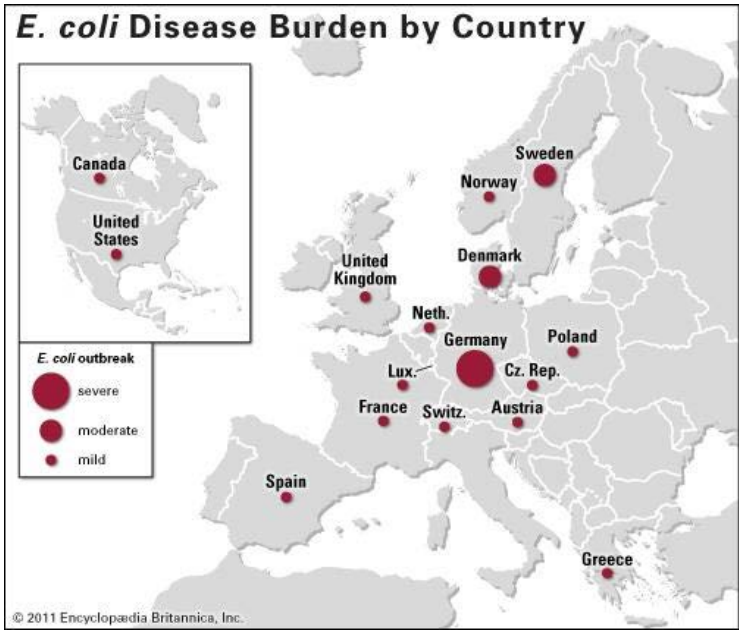

# What affects food integrity



- Microorganisms
- Chemical pollutants
- Bad food production/processing practices, including frauds

# What affects food integrity - microorganisms

- Microbial ecology of the food chain
  - Biodiversity, behaviour, persistence of microorganisms
- Molecular biology of emergence, survival and pathogenicity
- Use of advanced technologies




2011 German *E. coli* O104:H4 outbreak

# What affects food integrity - chemical pollutants

- Allergens
  - High priority due to severity of effects
- New and unexpected toxicants
- Over doses chemical ingredients
- New and unexpected effects

# Why food chemical contamination subject is more and more debatable

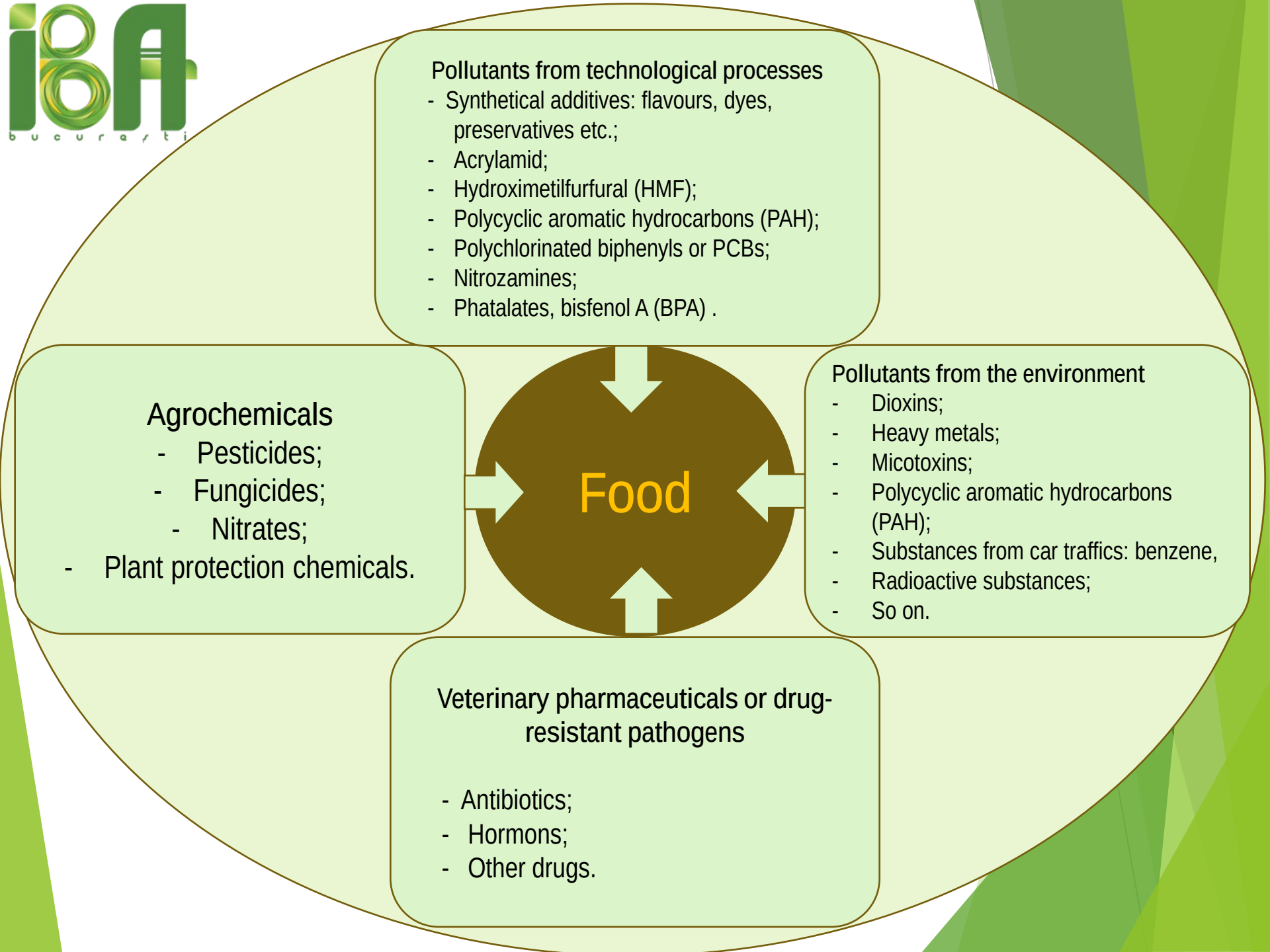
- capacity of food to accumulate chemical substances from the environment (agriculture and food industry technologies);
- influence of health by human exposure;
- the widening of the phenomenum and its continuos expanding.

The toxicity of chemicals in food are depending on:

- Quantity and periodicity;
- Sinergies and antagonisms between chemical substances and food;
- Metabolic changes on the animal/vegetal tissues which will lead to decrease/increase of pollutant toxicity.

**Bioaccumulation** = occurs when an organism absorbs a toxic substances at a rate greater than at which the substance is lost.

**Biomagnification** is a result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next trophic level in a food chain"
– US Environmental Protection Agency, 2000.


Pollutants from technological processes
- Synthetical additives: flavours, dyes, preservatives etc.;
- Acrylamid;
- Hydroximetilfurfural (HMF);
- Polycyclic aromatic hydrocarbons (PAH);
- Polychlorinated biphenyls or PCBs;
- Nitrozamines;
- Phatalates, bisfenol A (BPA) .
Agrochemicals
- Pesticides;
- Fungicides;
- Nitrates;
- Plant protection chemicals.
Food
Pollutants from the environment
- Dioxins;
- Heavy metals;
- Micotoxins;
- Polycyclic aromatic hydrocarbons (PAH);
- Substances from car traffics: benzene,
- Radioactive substances;
- So on.
Veterinary pharmaceuticals or drug-resistant pathogens
- Antibiotics;
- Hormons;
- Other drugs.

# Dioxin contamination incidents

- 1976 - Seveso, Italy: large amounts of dioxins were released in a serious accident at a chemical factory.
- 1997 – Germany: reported dioxin contamination of samples of milk, butter, beef and veal. 1997 – Spain: dioxins of the milk samples, taken from different farms.
- 1998 - UK: eggs and poultry meat from a farm located near a chemical waste incinerator contained high concentrations of dioxins, above the maximum level.
- 1999 - Belgium: high levels of dioxins were found in poultry and eggs.
- 1999 – Belgium: dioxins of poultry meat and derived products (re-used fat)
- 2006: a study conducted in EU countries shows that the system obtained organic eggs are high in dioxins
- 2007 – Hungary: presence of dioxins in the food additive E-412 (guar-gum), imported by a Swiss company from India.
- 2008 - Researchers from Spain and Finland have shown that breast milk, collected from 15 mothers living in areas near incinerators of waste; Ireland: recalled many tons of pork meat and pork products when up to 200 times the safe limit of dioxins were detected in samples of pork - contaminated feed; Tarragona (Catalonia, Spain): exposure to contamination by dioxins of the population of, a town located near to waste incinerators.
- 2010 – Germany: contamination with dioxins of pork and poultry, and eggs - animal feed, contaminated oils.

# What affects food integrity – Food fraud

- is generally regarded by a wide range of agencies and organizations as illegal deception for economic gain using food (USP 2009, EC 2013, DEFRA 2014, Global Food Safety Initiative 2014, CFSA 2015).

- = a collective term used to encompass the deliberate and intentional substitution, addition, tampering, simulations, mislabeling or misbranding or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product for economic gain.

All types of Food Fraud can create enterprise wide risks so an Enterprise Risk Management system must cover all types of vulnerabilities.

# What affects food integrity – Food fraud

- The economic impact of a Food Fraud incident can negatively impact more than just public health and can severely impact companies, industries, or even entire country economies.

Ex.

- the 2007 alleged date-code tampering in China reportedly caused a 0.8% drop is McDonald's Corporation's stock price (Jargon 2014). With a $90 billion market capitalization, this was a loss of almost $900 million.
- quality and safety concerns of Fonterra products reportedly cost Danone (and Fonterra) lost sales of almost Euro 300 million. Melamine in Fonterra dairy products led to massive losses in New Zealand including the national currency reportedly being devalued after the incident (Fickling 2013).

The EC has been addressing Food Fraud within the Food Integrity focus area primarily resulting from the 2012 illegal horsemeat adulteration incident (EP 2013).

- Over last 20 years food production has changed tremendously making:
  - Agrochemicals
  - Chemical additives
  - Drug for treatments (antibiotics)
  - so on

prevalent in the food we eat today.
Technology should normally represent one step ahead, but when used without integrity, it will lead for sure to many negative effects.

People are inclined to trust that the food they eat has been tested and can be considered safe, but anyone who has worked or knows somebody working in the industry knows that profits are the ultimate goal.

EU food safety and consumer protection rules are clear: **consumers must be informed of what they are buying**, and all ingredients must appear on the package label.
If they want to stay competitive, the actors along the food chain need to move towards transparency that promotes the disclosure of relevant and usable information from the chain to the wider public.

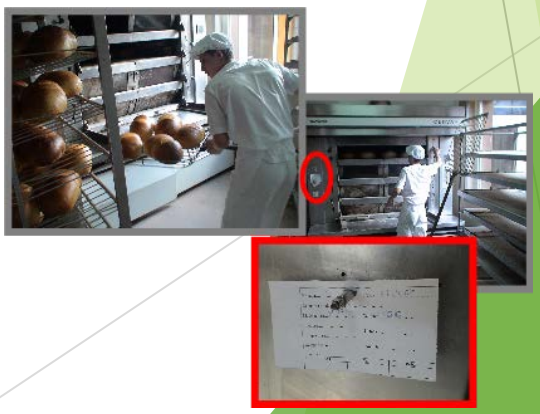
- European consumers are worried about the safety of their food.
- These concerns are caused by a continuing sequence of food scandals (i.e. food frauds) and incidents during the last decade.
- In response, consumers call for high quality food, food integrity, safety guarantees and transparency. Governments are imposing new legislation.
- Retailers are imposing new demands on their supply chains.
- Food supply chains react by implementing systems to improve the product's quality and guarantee its safety, at the same time making transparent that they do so.
- Such actions can be taken at the level of either the individual company or the complete network of supply chains.
- Understanding of the determinants of consumer confidence in the safety of food is important if effective risk management and communication are to be developed

# Technologies for Safer Foods

## Tools for Risk Assessment and Management

- Systems analysis approach
  - From farm to fork inc. restaurants and pvt. homes
- Risk vs. benefit analysis
- Certification and management
- Holistic methods
  - More than HACCP

- Preservation and mitigation
- Detection and monitoring



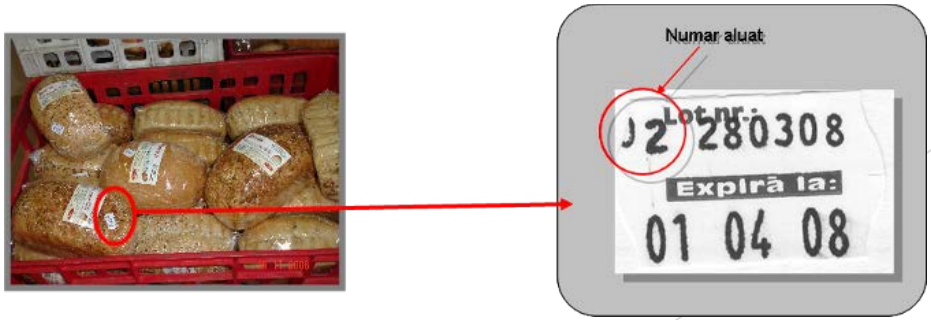
# Traceability

Current traceability systems are characterized by:

- the inability to link food chains records,
- inaccuracy and errors in records
- delays in obtaining essential data,

which are fundamental in case of food outbreak disease.

These systems should address the recall and withdraw of non-consumable products.



# Traceability

- Traceability = The ability to access any or all information relating to that which is under consideration, throughout its entire life cycle, by means of recorded identifications.
- Food traceability = high potential for consumer's protection by targeting precisely the recall, eliminate the non-consumable food products and promoting the investigation of the causes of food safety issues;

all of above mentioned are integral part of food safety, food quality, food defence and intrinsic requirement of the food supply-chain.

Source: R. Badia-Melis, P. Mishra, L. Ruiz-García, Food traceability: New trends and recent advances. A review

# Traceability

- Enhanced transparency in food supply chains is needed **to build confidence and trust and thus empower consumers** to make informed food choices supporting their health.
- Consequently the food industry should be positively influenced to meet the challenges and demands from consumers and regulatory authorities for **enhanced transparency of the food supply chain** system.
- The needs and demands for **fulfilling transparency and ensuring integrity** of the food supply chains require tailored solutions
- While food regulations have been updated, the demand for transparent data systems from the distribution networks is increasing, especially with food scandals like the recent Findus case horse meat in beef lasagna (Feb. 2013), horse meat in hamburgers (Des. 2012) and bean sprout incident in Germany (2011).

# First point of traceability: labeling

- There is a lot of controversy regarding:

a) how much consumers wish to know about the products they buy,

b) the time consumers have to receive the information at the point of buying and,

c) the space available in which to communicate information on, or near, the food products

(Schiefer and Deiters, 2013).

- The key data elements, which are present on the food product´s labels, give details according to labelling requirements i.e. ingredients list, nutrient information, supplier etc.
- Mandatory food labeling thus conveys indirect multi-criteria messages about food quality, safety and nutrition.

# Conclusions: Food safety is part of society

- Great societal challenges are closely connected to food safety:
  - Meeting food demands for increasing world population: an increase in food production and also a **reduction in post-harvest spoilage**, which is estimated to cause the loss of as much as 40-50% of world food production today.
  - **Special foods for special needs** with specific functional properties, novel ingredients etc.) is increasing, requiring different safety concerns, including the necessity to improve the present knowledge on novel and unexpected hazards.
  - The society expects **their foods to be unspoiled and safe**, which means free from chemical contaminants, pathogens and toxic substances. Delivering all these solutions and others not yet thought of, to all corners of the EU safely throughout the entire supply chain, will require a constant investment of innovative power into food safety science and technology. We cannot afford to be complacent.
  - **Convenient** and ready-to-eat foods
  - The role of in-home preparation as the root of many food-borne illnesses. Here **consumer education** is the answer and this should be considered a very important task.

# Conclusions: examples of new initiatives in assuring food integrity

- USA: Food Fraud Network of government agencies sharing information and intelligence on incidents.
- EU-wide Rapid Alert System for Food and Feed (RASFF) food recall system to include “adulteration and fraud.” Both intentional and unintentional fraud acts are included this category.
- The EC considers Food Fraud to be a serious issue and has funded a Euro 12 million Food Integrity Project. The project is limited to European researchers and focused on protecting the European market.
- Additionally in Europe, Food Fraud was reportedly defined as a “top-5” Europe-wide focus – not just  a top-5 food issue but a top-5 issue of *all issues*. This is understandable since a major portion of the European economic is value added food products.

# Recommendations: Importance of food integrity

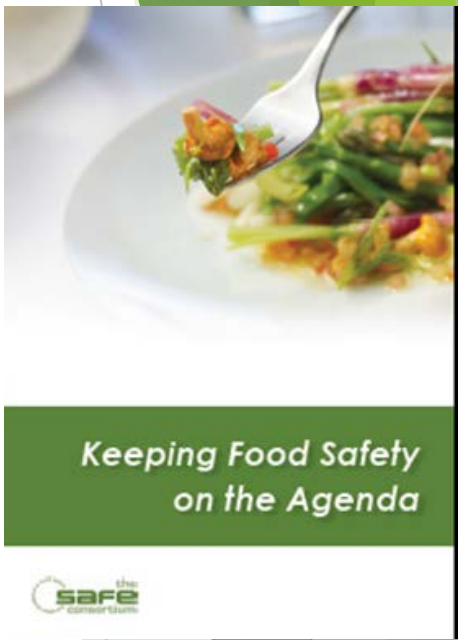
- Food integrity is the basis of the trust/confidence in the modern food chain that will have to deal with increasing resource constraints, including climate change, regarding food.
- Food integrity is a must, food security is a possibility that we can not overlook.
- Food integrity focus must be proactive, being the basis of food quality and the foundation for food of our future.
- Food integrity should be much more present in the present food debate and future research programming priorities
- A global vision on risk assessment is required

# SAFE Consortium Association

www.safeconsortium.org

In 2013 SAFE Consortium released a white paper with its vision on Food Safety, now through 2020 with 5 specific directions:

- The citizen and food safety
- Microbiological hazards and spoilage organisms
- Chemical and allergenic hazards, including toxins of biological origin
- Tools for assessing and managing risks in the food chain
- Technologies for making foods safe and increasing shelf life




Beginning with 2014 the main core theme was Food Integrity: Beyond Authenticity and Safety.

Recent scandals about adulteration and fraud were perceived by public as food safety threats and this confirms the urgency of food authenticity and traceability as a part of total food quality and safety – FOOD INTEGRY.

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