GLOBAL CENTRE FOR
FOOD SAFETY AND QUALITY

DISH

HIGH LEVEL SUMMIT

New issues and emerging trends in food safety

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SESSION

Quality and authenticity / Fraud and traceability
Policies and regulation / Retail and logistics
Consumers choices / The supermarket of the future
A way forward in food safety emerging trends

DTU Food
National Food
Institute

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Session 1 - INNOVATIVE METHODOLOGIES FOR QUALITY AND AUTHENTICITY –

Prof. Tullia Gallina Toschi

Major messages delivered by the speakers

Mineral Oil Hydrocarbons in Food: Sources, Occurrence and Analytical Challenge - *Sabrina Moret, University of Udine***

Mineral oils are products obtained from petroleum distillation and refining. According to the most recent literature, mineral oil is the most represented contaminant in the human body (5 grams). However, the consequences on human health are still unknown, with evidences that in fish and rats, they cause inflammation and granuloma formation. Little is known about real implications in humans. The main sources of MOH contamination of food are processes undertaken in the food industry, background contamination in vegetables and vegetable oils, food packaging.

There is a Commission recommendation 2017/84 according to which member states should monitor the quantity of contamination in food. To date, there are no legal limits on MOSH and MOAH in food and food packaging, but different limits have been proposed. For instance, in April 2019 the leading association of the German food sector (BLL) proposed "Orienteering Values", agreed between different associations and supervisory entities, that take into account the background level present in food as well.

A Foodlab in the Palm of Your Hand. Reliable Nano and Micro-Solutions for DNA Analysis For Authenticity And Food Safety - *Marta Prado, INL***

Traditional DNA analysis methods are slow, expensive and complicated, hence a fast, sensitive and in situ detection is useful in order to produce reliable results in different steps of the chain.

INL's approach involves fast analysis and minumum handling and allows tailored design depending of the samples of interest, the possibility of using the modules independently and combining them with conventional approach for some specific analytical needs.

INL adopts a modular approach to develop reliable analytical solutions, based on microscale solid phase extraction followed by isothermal DNA amplification (specific detection of organisms of interst on miniaturised devices) and optical/visual detection using nanomaterials for higher sensitivity.

Design Blockchain To Protect Quality And Authenticity Of High Value Foods - Henning Høgh Jensen*, DTU*

The food chain has become globalised, so there are more cases of food adulteration. The reason for cheating is the high value of food products: the higher the value, the lower the chance to be caught, thus here profit exceeds risks. Innovation needs close collaboration between companies and academia.

IBM's blockchain-based food traceability platform is now available for global use by retailers, wholesalers and suppliers across the food ecosystem. Since price represents a barrier for SMEs, DTU has proposed a bottom-up approach to design a blockchain that can be widely shared, with the participation of consumers, producers, SMEs and big companies.

Main conclusion achieved and their relation with the main objective of the session

Moret: Mineral oil used in the food industry (including food packaging) and in today's polluted environment is the most represented contaminant in the human body, but the related consequences on health still remain unknown. Such uncertainty makes it difficult to establish ADI values and maximum limits in foods. Moreover, attention recently focused on migration from cardboard packaging. To date, there is no consensus on MOH limits in food. In fact, there are no legal limits on MOSH and MOAH in packaging and food – only German Authorities proposed maximum limits in 2011. This should be taken in serious consideration for evidence-based policy making.

Prado: The "from farm to fork" chain involves many steps and is a relatively fast process, whereas methods of analysis are slow, expensive and complicated. To avoid a conventional and bench-top, time consuming approach, INL's approach involves fast analysis and minimum handling, allows tailored-design and the possibility of using the modules independently, and eventually integrate all steps of the analysis on lab-on-chip format.
Jensen: The Food System need to face the price barrier and facilitate the adoption of blockchain technologies by SMEs with a bottom-up approach, in order to enhance consumer trust through better quality and authenticity of food products.

Session 2 - INNOVATIVE TECHNOLOGIES FOR FRAUD AND TRACEABILITY

Prof. Christine Nelleman

Major messages delivered by the speakers

H2020-EU-China-Safe: Towards Collaborative Leadership to Tackle Food Fraud - *Yongning Wu, CFSA, China*
In Europe and China, consumer trust in the food industry and regulatory authorities has been damaged by a large number of accidental and deliberate food contamination and adulteration incidents. Hence, these safety, traceability, regulatory and fraud issues has hampered the ability of European companies to export to, and import from China.
Laboratories in Europe and China are often working according to different quality standards and using different analytical methods, which can result in protracted trade disputes. To face this discrepancy, the EU-China-Safe project (whose consortium includes 16 European and 17 Chinese partners) aims to build the core components of an EU-China food control system by harmonising the following five key elements: Food control management; Food legislation; Food inspection; Food control laboratories; Food safety and quality information, education and communication.

METROFOOD-RI in support to food traceability and food safety - ***Claudia Zoani**, ENEA, Italy*
METROFOOD gathers 48 partners (research institutes, universities, national metrology institutes, institutes for food safety and health protection, laboratories for food analysis, private companies) from 18 countries work as a system to reach the general objective of promoting metrology in food and nutrition and, specifically, the following missions:

- ✓ To enhance scientific excellence in the field of food quality and safety,
- ✓ To enhance quality and reliability of measurement results,
- ✓ To make available and share data, information and metrological tools,
- ✓ To strengthen scientific knowledge, promoting scientific cooperation and integration.

METROFOOD combines Physical infrastructures (from the Metro side, there are 16 specialised distributed facilities for RM development and production and 130 analytical laboratories; from the Food side, there are 32 distributed experimental facilities that include field trials, greenhouses, grow chambers, experimental stables and fisheries, experimental plants for food processing, packaging, storage and preparation) and electronical infrastructures towards integrated data platform.
The potential users of such services are researchers, policy makers and food inspectors, food business operators, consumers and citizens. The goal is to promote excellence and interoperability, enable the Agrifood sector to digitalization and internationalization, in order to ultimately align research and innovation with the values, needs and expectations of the whole society.

The challenges for authorities to tackle food fraud - *Erik Andersen, DVFA, Denmark*
The DVFA fraud strategy covers food, feed and veterinary issues with a scientific approach that involves stakeholders of different nature (Danish food industries, retailers, wholesalers and consumer organisations, universities and research institutions, consultants) and pays special attention to international cooperation and participation. In particular, it is important to take advantage of existing networks, such as the EU Food Fraud Network, where cooperation between officials with EU agri-food chain knowledge, police and customs officers with

investigative powers, judges and prosecutors administrations can guarantee the safety of circulating products. Moreover, the operation OPSON is also active in targeting fake and substandard food and beverages, working jointly with Europol and Interpol.

Foodomics: a powerful approach for traceability - *Francesco Capozzi, UNIBO, Italy*
The European logos identifying Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) collective marks have been developed and used for branding those European food products that fulfill specific requested and certified characteristics. A useful approach in this field can be applying molecular fingerprinting to food tracking. Using NMR spectroscopy and chemometrics, in particular, the IGP cherry tomato of Pachino has been studied in order to determine whether tomatoes produced in the Pachino terroir are chemically distinguishable from tomatoes produced elsewhere. This is a valuable technique, applicable to many other food products, which can provide a sort of DNA barcoding of food varieties.

Main conclusion achieved and their relation with the main objective of the session

Wu: EU-China-Safe's ultimate goals is to develop and implement a shared vision of best practices, collaborate and exchange knowledge to achieve mutual recognition of food control data and standards, restore consumer trust, enhance food safety and prevent food fraud.

Zoani: METROFOOD-RI contributes to enhance traceability by providing distributed services, acting on the real plan of measurement reliability and procedure harmonization and adopting the FAIR approach on data management. In particular, it provides metrological and standardization services; agro-ecosystem characterization, food analysis, food packaging testing and characterization; services related to the improvement of food production and consumption; e-services, in the framework of a better anti-fraud system.

Andersen: it is crucial to adopt a wide and inclusive point of view concerning food fraud, as many actors are called to intervene in order to settle disputes and protect food authenticity.

Capozzi: For a quality-certified agricultural product the scientific assessment of its authenticity is a key step in protecting both producers and consumers from attempts of counterfeit which exploit its good name in order to sell fake products. Foodomics can help in this sense. In the future, hyphenated methods which couple classical methods of separation such as HLPC and GC with NMR will be exploited for identifying those molecular markers.

Session 3 - Round table on policies and regulation
Prof. Davide Viaggi

Major messages delivered by the speakers

***Huub Lelieveld**, Global Harmonization Initiative*
There is urgent need for more sustainable food production, more interaction with SMEs, re-evaluation of some legal frameworks.

***Dorte Lau Baggesen**, Technical University of Denmark*
Legislation: agree on the need of reevaluating some legal frameworks to evaluate the opportunity to go more into the green economy. However, this cannot be done without including the food safety issue. Finding a balance between risks and benefits will take a lot of time.

***Johanna Vilkki**, Natural Resources Institute Finland –LUKE*
There is a big need for sustainability, but production systems vary a lot. For this reason, it is not easy to reach the creation of a common sustainability label.

***Susanne Braun**, University of Hohenheim and FOODforce Network*
Consumer must be involved in all research activities of the food chain. To do so, it is important to reduce the costs, interact with small producers (those producing the most part of the food we eat, who must be involved in the innovation process), invest in advertising and education/training opportunities. Moreover, further tailor-made research for food products and their traceability is also needed. This is also key part of the FOODforce Position Paper on Food System.

***Vittorio Zambrini**, Technical Scientific Committee of CLAN Agrifood and Granarolo*

There is a need of research and innovation to develop products containing bioactives towards a personalised nutrition. However, legislation and consumer distrust hinder the marketing of functional foods. The case of Italy: despite being one of the top producers of nutritional supplements, it still faces strict regulations that hinder the production and marketing of functional food. Italian producers are obliged to make a health claim specifying the function of the supplement, whereas in case of functional food they must go through EFSA (which is time and money consuming) – so the success rate is very low.

***Tom Heilandt**, Codex Alimentarius Commission FAO/WHO*
Concerning regulations about gene editing and alternative proteins, CODEX has not yet expressed its view, since it is a members-driven organizations and member states have not brought these issues before CODEX yet. Nonetheless, this year the Food Labelling Committee started discussing about pack labelling, online sales of food and relative labelling requirements. Hopefully, the next discussions in CODEX will consider evidence-based standards in order to ease some debates, for example about growth-promoting substances in meat production.

Main conclusion achieved and their relation with the main objective of the session

What do you suggest for the future of the EU?

Lelieveld: Ethics in the food industry must be higher: inaccuracies must be reported before the occurrence of illnesses. The risk of being fired for employees reporting inaccuracies must be overcome.

Baggesen: Involvement of different stakeholders in order to harmonize the different perspectives.

Vilkki: the blockchain might solve the issue of a common sustainability label, which is much needed at the European level.

Braun: many activities can be done in order to promote a widely shared food policy in the EU. For example, multi-actor reaction groups and meetings involving different stakeholders might ease the exchange of opinions and informations. Concerning the ongoing projects, there is a need for more flexibility, especially regarding the objectives which can be adapted to the changing environment. Moreover, projects need to connect to each other and be more transparent about their activities, so that knowledge is easily shared.

Zambrini: regulations and processes must be simplified in order to meet the needs of new food production.

Heilandt: some recent discoveries, like food printers for example, may create issues in case their use increases, from the safe delivery of raw materials to the proper functioning issues. Therefore, there is a strong need for international discussions, not only between scientists, but also at governamental level in order to draft

international regulations, putting aside politics and focusing on evidence-based data. CODEX can then play a crucial role in legitimizing and coordinating the regulations.

Session 4 - INNOVATIVE TECHNOLOGIES FOR FOOD PRESERVATION, RETAIL AND LOGISTICS – Prof. Terence Lau

Major messages delivered by the speakers

Food Safety Decisions – Tools and tips for food producers of ready-to-eat foods - ***Olaug Taran Skyerdal,*** *Norwegian Veterinary Institute, Norway*
In order to ensure food safety, food producers can, first of all, follow the law, then use safe product formulation and process conditions, use preservatives and set reasonable shelf life, ensure raw material and supply chain conditions, and assess consequences in case the food is contaminated, stored/processed at abuse conditions and consumed by vulnerable consumers. It must be kept in mind that supply chain conditions are sometimes more important than product storage conditions.

Nonthermal food processing from lab-scale to innovation - ***Oliver Schlüter****, ATB, Germany*
Consumers requested for minimal processing technologies for food: high pressure, ultrasound, pulsed electric fields, UV and pulsed light, and cold plasma. Plasma processes are a new technique and imply a number of advantages, among which their high antimicrobial efficiency at low temperatures, low impact on the internal product matrix, resource-efficiency. Plasma entails a number of challenges as well, such as its cost efficiency, up-scaling, process uniformity and legal aspects.

Minimized food waste and increased food quality and safety from intelligent packaging systems - ***Fredrik Nilsson****, Lund University, Sweden*
Intelligent packaging systems in food supply chains allow for lower food waste, enhanced control of food quality and increased transparency and food safety.
The Internet of Things (IoT) represents a potential enabler for increased transparency.

Microbial risks and food quality detection in the kitchen ecosystem - ***Erika Menosso****, Electrolux, Italy*
Starting from the wide food system scenario, Electrolux considers the specific process where consumer is the key element of the food integrity assurance and the linking point with the sustainability, health and wellbeing challenges. The most relevant aspects for consumers are food quality perception and micriobio detection.
In order to support consumers' conscious choices, Electrolux established the *Food Foundation* with different projects aimed at leveraging and sharing knowledge about food, and began a partnership with KARMA (Swedish start-up), whose aim is to exercise on new business models, new ways to sell food collaborating with supermarkets, including the possibility to buy food after the common supermarket opening time. The final aim is to explore the possibility to change the price of supermarket's food according to its expiry date.

Main conclusion achieved and their relation with the main objective of the session

Skjerdal: The production of ready-to-eat foods is complex: food safety is only one of the aspects to consider. Decision support tools need to build on realistic conditions and options to be useful: to this matter, models prove useful for estimating the effects and possible gains. In particular, simple farm-to-fork models that can be set up for any product in order to assess consequences are sometimes better than complicated ones.

Schlüter: Potential plasma applications in postharvest food processing, in particular regarding plant pests, microorganisms, viral pathogens, enzymes, toxic residues and so on, includes modification (hormetic effects, secondary metabolites in plants, extractability, …) and/or functionalization (surface properties).

Nillson: intelligent packaging systems can benefit both the production and retail side, in particular using Internet of Things solutions on secondary packaging, prolonging printed shelf life based on analysis of real data, securing cold chains with unified ways to measure temperature, enhancing traceability in industry, enabling transparency among actors and consumers alerting functions for changes in temperature, location, impact and time. From the consumption side, visible temp-timer on primary packaging can help defining the proper expiration date.

Menosso: Technology is a pillar in the economic system and in the whole food value chain – but still seems quite hidden and unclear in the common food system frameworks that is circulating in recent debate. It is important to recall the relevance of technology not only from the supply and farming side, but also from the demand and consumer side and, in particular, in the food safety/sanitation, refrigeration, preparation and waste processes.

Session 5 - INNOVATIVE TECHNOLOGIES AND CONSUMER CHOICES

Prof. Yvonne Granfeldt

Major messages delivered by the speakers

Effective food allergen management strategies to assure safe food choices for allergic individuals –
***Roland Poms**, MoniQA Association*

Food allergies are a public health and a societal issue, as allergen-related incidents contribute to the burden of food-related incidents. Labelling enables allergic consumers to manage and mitigate risks through avoidance. There is international consensus on the fact that the presence of priority allergenic foods should always be subject to declaration in the list of ingredients on a food label.
Food allergen management requires a collaborative approach:

- industry needs clear guidance and limits, information on what to label → labeling directive for food allergens
- consumers are usually conscious about their allergies and what to avoid, but they need not to be misled by unclear of wrong labels
- government and regulators

Risk analysis approach applied to food allergens: each food manufacturer must do his own specific risks assessment, management and communicaation, because the ways the manufacturing sector is organized may differ. Codex alimentarius 5 will start working again on food allergens with the new data available.

Food innovation consumers driven – a complexity of demands and expectations
***Christophe Cotillon**, Actia Association*

Consumers have gained importance in R&I programmes in the last frameworks: research on consumer attitude and behaviour to better understand their expectations is present in both FP6 and FP7, then H2020 included multi-actor approach and the active role of consumers in the food systems.
It has been recently detected a transition from a passive (food security first, quantity over quality, price-driven, choice availability, low interest and knowledge about production system) to an active consumer (who puts food quality first, pleasure and wellbeing, whose choice is health-driven, demands for selection, curiosity and information demand).
In France, for example, it has emerged that food is commonly related to pleasure (65%), consumers look for good quality (66%) and tasty (40%) food, they are interested in food innovations and want to consume healthy (63%) and balanced (59%) diets.

Green impact factories: the connection between circular food production and food safety and quality
***Svensson R. Lennart**, Region Skåne*
"Smart food" is a challenging food system with people and society at the center. The **food safety benefits** from such circular food production are: New methods and technologies for utilizing residual flows and increasing crop sustainability; Recovery of nutrients from residual streams to feed and plant nutrients; Nitrogen / phosphorus circulation; Production open for consumer involvement and testing: Closed and controlled production system

Risk-Benefit Assessment: science to empower the consumer - *Maarten Nauta, DTU, Denmark*
The Risk-Benefit research group of DTU provides dietary advices for the population on health risks and benefits, estimates the expected health impact and gives personalised advices and recommendations based on personal traits and preferences. This personalized approach empowers consumers to manage their own health.

Nanotechnology as a way to produce bio-based and biodegradable food packaging with enhanced properties
***Lorenzo Pastrana**, INL, Portugal*
INL is the only institute fully dedicated to nanotechnology applications. The institute follows an integrated approach, where different aspects of food safety are tackled. The Department of Life Sciences is currently working on films, improving, among others, the hydrophobicity of cellulose and modifying the tension of the surface. In particular, researchers from INL have discovered that the incorporation of bacterial cellulose nanocrystals in all cellulose films can help improving the mechanical properties of the films.

Main conclusion achieved and their relation with the main objective of the session

Poms: From an iFAAM survey, it emerged that the majority of the allergic individuals considers a product without precautioning allegen labelling "may contain" as not necessarily safe to eat (more than 50%), while a quarter of them considers it as safe. Building on this, it must be recalled that there is no "zero risk" and, on the one hand, the occurrence of food allergic reactions triggered by the consumption of undeclared allergens must be minimised and, on the other hand, the choice of safe and nutritions food to allergic consumers must be maximised.

Cotillon: Regarding consumers' attitude, there is a big difference between what they declare during investigations and how they actually behave at home. Also, even at home, they often change their behaviours regarding many factors related to food, thus this societal group is not easy to follow. The identified solutions to improve consumers' expectations are ICT, block chains and easy-to-understand information available for consumers.

Lennart: Policy makers can build and maintain adequate food systems and infrastructures to respond to and manage food safety risks along the entire food chain, including during emergencies; foster multi-sectoral collaboration among public health, animal health, agriculture and other sectors for better communication and joint action; integrate food safety into broader food policies and programme (e.g. nutrition and food security); think globally and act locally to ensure the food produce domestically be safe internationally. Moreover, it is important to facilitate the development of food safety through controlled system-environment, but also to gain consumer trust thanks to open data, A.I. and sensors. Food safety must be tightly linked to sustainability and circular food production.

Nauta: As far as future perspectives are concerned, methods need to be further developed; availability of data on dose response and diet and substitution effects need to be increased; more case studies should be examined. Also, beyond health, the sustainability and economic impacts should be taken into greater account.

Pastrana: Nanostructures can be powerful tools for food preservation, and can be used to create antifungal coatings especially with fruit. This application would overcome the use of paraffin and chitosan, which are widely used in the supermarkets nowadays for food fortification.

Session 6 - Round table on THE SUPERMARKET OF THE FUTURE

Prof. Mario Mazzocchi

Major messages delivered by the speakers

***Yves Rey**, Global Food Safety Initiative, GFSI*

One way for the industry to ease consumer knowledge about food is changing the way food quality is communicated to consumers, by reducing marketing expenditure while investing in education. Harmonization of food safety management is also needed in the framework of reshaping the food industry in terms of innovation and technology,

Nutrigenetic can customize meals, tailor-made them according to DNA analysis, biometric, food preferences, data storage – if used well, this could help solving obesity. Novel foods spreading is hindered by time-consuming procedures and restrictions imposed by regulations.

***Gabriele Tubertini**, COOP Italia*

In the supermarket of the future, as shown during the Milan EXPO about food in 2015, technology will be used to involve consumers more and provide them with information *while* they make their choices, right in place. In this process price remains the most important factor for consumers' choices, although nowadays consumers are more willing to consider other aspects of the food they choose. Another recent trend concerns ready-to-eat food, which has grown in sells in Italy, especially in the forms of food delivery. In this last case plastic policy is misleading for consumers, especially considering that e-commerce produces more plastic packaging.

***Begoña Pérez-Villarreal,** EIT Food*

It is important to engage consumers in all processes of the food chain.

In particular, it is crucial to:

- listen to consumers' needs (according to EU data, 66% consumers are concerned about long-term impact of food products, 71% requires more information about the food they eat)
- gain consumer trust (since consumers trust farmers more than producers, we need to work on reliable information, backup the real data of the food sector)
- observe what is going on (co-share supermarkets are emerging where consumers and small local producers collaborate to sell organic and km0 products)

***Chinchin Chen**, Oxford Martin School*

Automatized jobs in the food sector can be parallel to human jobs, since the food sector is still depending on highly specialized manufacture. In recent times the online supermarkets are getting more and more clients as the quality of the products they sell is quite high and the consumers believes they can have more information about what they buy, but also a wider range of available products. Still, consumer's direct experience with food (involving touching the food, or seeing it in person) is highly valued, and therefore it hinders the widespread of these new forms of supermarkets.

Main conclusion achieved and their relation with the main objective of the session

Rey: Consumers education is essential in order to promote an informed food choice and enhance trust in food retail

Tubertini: Informing the consumers in order to let them make responsible choices is important, but there is also room for improving the quality of products in the sector of ready-to-eat food and food delivery

***Pérez-Villarreal**:* In the future we can have personalized food even for the consumer's mood, so innovation will play a key role

Chen: Consumers should have the power to reshape e-commerce, according to their needs and valuing the consumer experience