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EFSA's third Scientific Conference 'Science, Food, Society': concluding remarks

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Abstract

From 18–21 September 2018, EFSA hosted its third Scientific Conference on Science, Food and Society in Parma, Italy. This paper summarises the overall recommendations on future actions and research priorities of the conference and complements the earlier multi-authored papers in this issue. The conference started and closed with the plenary sessions 'where science meets society: putting risk assessment in context' and 'staying relevant in a changing world', respectively. In between, there were seven breakout sessions five of which aimed at advancing risk assessment science in the areas of human health, the environment, biological hazards, nutrition and managing evidence, and two of which were dedicated to the societal aspects of risk assessment: engaging with society and envisioning the expertise of the future. During the 4 days of the event, participants addressed the complex interplay between science, risk assessment, policy and society, and explored how to advance food safety risk assessment to address the challenges of a changing world and ensure preparedness. Acknowledging that good science alone is no longer sufficient to ensure fit-for-purpose food safety risk assessments, EFSA must further build on its current five Strategic Objectives. To ensure that its risk assessments remain scientifically robust and sound, EFSA should strive for robust and fit-for-purpose risk assessments; consider food in the context of safety, nutrition and sustainability; and explore further how EFSA can work with other organisations to achieve the One Health/One Environment goals. In addition, EFSA should base scientific risk assessments on reliable science while capitalising on scientific advances; address scientific uncertainties; and fully publish the evidence and data used. In line with societal expectations, EFSA, in coordination with risk managers, should frame risk assessments through clear policy goals and problem formulation; be explicit about value judgements; communicate clearly and consistently and in coordination with risk assessors and risk managers; involve society; avoid conflicts of interest; and follow trustworthy processes.

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1. Introduction

From 18–21 September 2018, the European Food Safety Authority (EFSA) hosted its third Scientific Conference on Science, Food and Society in Parma, Italy (<http://www.efsa.europa.eu/en/events/event/180918>) (Devos et al., 2019a; Url, 2019). The conference brought together a large international audience composed of scientists, risk assessors, risk managers, as well as non-governmental organisations and industry representatives: 1,120 participants on site, and 800 attendees online. The conference was constructed to address the need for risk assessment to stay relevant in an ever-changing world, at least in part through a better contextualisation in the social and political arena.

The conference built on the current five Strategic Objectives of EFSA's 2020 Strategy (EFSA, 2016; Robinson et al., 2016): Strategic Objective 1 (Prioritise public and stakeholder engagement in the process of scientific assessment), Strategic Objective 2 (Widen EFSA's evidence base and optimise access to its data), Strategic Objective 3 (Build the EU's scientific assessment capacity and knowledge community), Strategic Objective 4 (Prepare for future risk assessment challenges), and Strategic Objective 5 (Create an environment and culture that reflects EFSA's values).

The conference was an important opportunity for EFSA and its broader community of stakeholders to discuss the state of play and upcoming challenges in food safety risk assessment. The starting point was that regulatory science should not operate in isolation but should connect with society. During the 4 days of the event, participants addressed the complex interplay between science, risk assessment, policy and society, and explored how to advance food safety risk assessment to address the need to be prepared for new challenges in an ever-changing world. These discussions will help to shape EFSA's strategy 2021–2027. The resulting papers published in this special issue of the *EFSA Journal* provide an overview of recommendations for future actions and research priorities by EFSA as well as the wider food safety community.

The conference included two plenary sessions, seven breakout sessions, three poster exhibit sessions, three sessions of poster highlight pitches for early-career researchers and several satellite events. The conference was opened by a plenary session on 'where science meets society: putting risk assessment in context' touching upon the interaction between science, food safety risk assessment, policy and society. The conference continued with a series of breakout sessions on advancing risk assessment science in the areas of: human health, the environment, biological hazards, nutrition and evidence management. Two sessions, 'engaging with society' and 'envisioning the expertise of the future', were dedicated to the societal aspects of food safety risk assessment and the role of social sciences in both risk assessment and risk communication. On the final day, the conference closed with the plenary session 'staying relevant in a changing world', during which speakers and the panellists of the moderated panel discussion provided input for EFSA's strategic planning.

This paper summarises the overall recommendations for future actions and the research priorities identified during the conference. The conclusions are structured around the three pillars of the conference: Food, Science and Society.

The *Food pillar* addresses questions such as: How does food safety contribute to the United Nations Sustainability Development Goals? How closely does food safety relate to food sustainability, food security and nutrition? What is the role that EFSA can and should play in this context?

The *Science pillar* focuses on questions from the natural sciences angle including: How do we need to advance risk assessment science to address future challenges? What tools/data/approaches/expertise are needed to ensure food safety in the future? What developments in science are coming up and should not be ignored?

The *Society pillar* deals with questions including: What are society's needs and expectations and how can they shape food safety risk assessments? How can citizens provide valuable expertise and contributions to the risk assessment process in a transparent and efficient way? How do societal needs translate into defining what fit-for-purpose food safety risk assessments actually mean?

2. Food

Humans need sustainable, safe and nutritious food. EFSA's work covers many different areas of food safety risk assessment, some areas of nutrition (dietary reference values, health claims, etc.), as well as plant and animal health and welfare, which are closely linked to environmental sustainability and food security. Food and food safety are relevant for most, if not all, of the United Nations Sustainability Development Goals (SDGs; United Nations, 2015). More specifically, for the SDGs no. 2 ('Zero hunger'), no. 3 ('Good health and well-being'), no. 6 ('Clean water and sanitation'), no. 12 ('Responsible consumption and production'), no. 14 ('Life below water') and no. 15 ('Life on land'). The

Food and Agriculture Organization of the United Nations (FAO) previously stated in its 1996 'Rome Declaration on World Food Security and World Food Summit Plan of Action' that: 'Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1996).

The conference explored how science, food and society may change in the future, how these changes may impact food safety, and how EFSA should be prepared to address them. Scenario analysis was presented at the conference as it can be used to help to envision more sustainable and secure ways of developing future food systems by changing patterns of trade and diet (Benton, 2019). With this in mind, future scenarios were presented addressing different elements of the environment-agriculture-food-diet-health spectrum. This information was used to identify how changes may impact food safety, risk assessment and communication, and how to ensure EFSA is prepared to meet them.

The conference also explored the impact of the exponential growth in the volume and complexity of information, including data, relevant for food safety. The future of risk communication, considering the recent trends in the use and variety of social media and other platforms, was also debated. The interlinks between food safety, nutrition and food security were discussed in several sessions and raised interesting questions on the future of risk assessment and of EFSA.

3. Science

Data, methods and people are the three main ingredients for carrying out risk assessment, the core of EFSA's activities. EFSA applies and develops up-to-date methods and approaches to deliver pertinent scientific advice to risk managers. Science is continuously progressing and, in five breakout sessions, the advance of risk assessment science was addressed in the areas of: human health (Hougaard-Bennekou, 2019; Lanzoni et al., 2019), the environment (Devos et al., 2019b,d), biological hazards (Messens et al., 2019; Waltner-Toews, 2019), nutrition (Mathers, 2019; Woodside et al., 2019) and managing evidence (Cavalli et al., 2019; Hartung, 2019). In each of these sessions, the state-of-the-art was presented and challenges and opportunities for future risk assessment were identified. Conclusions and recommendations follow each of the individual session outcomes and have been included in the respective multi-authored papers. They focus on the preparedness angle and identify what risk assessors need to do to remain relevant and prepared for future challenges.

In the area of human health and chemical risk assessment (Hougaard-Bennekou, 2019; Lanzoni et al., 2019), many challenges were identified: moving away from the 'current/traditional' risk assessment paradigm (which is substantially hazard-driven and largely relying on animal studies), and requiring a better understanding of the mechanisms that lead to adverse effects and the more accurate prediction of the biological response to establish causality. Data and information from new approach methods are increasingly used to support regulatory science, and datasets beyond the traditional toxicological animal data are available (e.g. epidemiology and exposome). The use of these data and tools can facilitate a paradigm shift in the risk assessment, where testing strategies enable reliable, animal-free hazard assessments that rely on a mechanistic understanding of the chemical toxicity.

In the area of the environment, the focus was on problem formulation as a tool to frame the environmental risk assessment (ERA) of regulated stressors including those expected to emerge from development in the near future (Devos et al., 2019b), and on the opportunities, challenges and implications of applying an ecosystem services (ES) approach to the ERA of regulated stressors (Devos et al., 2019d). While applying problem formulation to ERA maximises the usefulness of ERA studies for decision-making, it is still often hindered by the absence of clear policy goals and decision-making criteria (e.g. definition of protection goals and what constitutes harm) that are needed to guide the interpretation of scientific information. It was therefore advocated to have a further dialogue between risk assessors and risk managers to clarify how ERA can address policy goals and decision-making criteria (Devos et al., 2019b). Since an ES approach can provide a comprehensive framework for considering nature's contributions to human well-being in ERA and risk management of regulated stressors, some of the opportunities, challenges and implications of applying an ES approach to the ERA of regulated stressors were addressed. An ES approach has the potential to enhance the ecological and societal relevance of ERAs, but realisation of this advantage will require challenges that impede acceptance of an ES approach to be overcome (Devos et al., 2019d).

In the area of biological hazards, health is challenged by the global movements of infectious agents, vectors and invasive species facilitated by trade, human mobility and environmental change (Messens et al., 2019). Major challenges are in the areas of antimicrobial resistance, vector-borne

diseases and the use of whole genome sequencing for risk assessment purposes. Since facts are often uncertain, values are in dispute, stakes are high and decisions are urgent in this area, Waltner-Toews (2019) suggests to frame biological hazards risk assessments as post-normal science.

In the area of nutrition (Mathers, 2019; Woodside et al., 2019), contemporary challenges have moved away from reductionist approaches (single nutrient deficiencies and lowering of energy, fat, saturated fatty acids, *trans*-fats, sodium or sugar intakes) to recognising the complex characteristics of foods and dietary patterns through different metabolic pathways, and more recently, to the role of specific foods and overall dietary patterns and other lifestyle modifications on disease prevention. Personalised nutrition is now broadening its scope to consider the effects mediated by the gut microbiome, as well as multiple aspects of genotype and phenotype. Such research has the potential to explain inter-individual differences in the response to specific dietary factors and may provide a scientific basis for more refined risk assessment.

In the area of managing evidence, the exponential explosion of data increases the evidence base available for risk assessment. The combination of new technologies and methodologies have great potential to access and analyse the 'right' data for regulatory-driven science (Cavalli et al., 2019; Hartung, 2019). Problem formulation is expected to remain largely in the hands of humans for the foreseeable future. However, (big)data availability and (big)data connection are already mainly in the done by machines. Evidence integration is currently mostly in the hands of humans and is expected to move increasingly towards the capability of machines. Blockchain technology provides for further exploration on its strengths and limitations for risk assessment purposes.

4. Society

As mentioned before, data, methods and people are the three main basic ingredients underlying risk assessments. These elements need constant consideration and adaptation to ensure preparedness for the future. However, at present, good science alone is no longer considered sufficient. There is a need to advance forms of risk assessment that are more contextual, and socially sound and accountable (Devos et al., 2019c; Patel, 2019; Smith et al., 2019). This for more transparency and engagement with society to better frame risk assessments. This could be achieved by: (1) framing risk assessments in food safety with clear policy goals, decision-making criteria and a problem formulation (Devos et al., 2019b,c); (2) addressing value-laden judgements transparently (Elliott, 2019); (3) reflecting social and ethical priorities (Patel, 2019); and (4) engaging with interested and affected parties (Smith et al., 2019). Social context requires trustworthy and open communication that acknowledges the importance of epistemic uncertainty, and societal views ought to be included in the evidence base for decision-making (Bucchi, 2019; Devos et al., 2019c; Smith et al., 2019; Zollo, 2019). Hence, greater discussion and interaction between risk assessors and risk managers is essential to clarify the policy goals and decision-making criteria. All this must be considered against a background of demonstrating a better engagement with society on the one hand, while remaining scientifically robust on the other as described by Devos et al. (2019c).

Knowledge and expertise are distributed throughout society, and are thus not confined to scientists. In order to foster effective communication and engagement in the future, regulatory agencies involved in food safety will need to work across disciplines and cope with cutting edge developments in artificial intelligence and citizen science (Naydenova et al., 2019; Noel-Storr, 2019). Challenges arising from behaviour, attitude and culture were identified at the societal level, the organisational level and the individual level.

The social dimension for scientific advisory bodies largely concerns science communication and public engagement (Bucchi, 2019; Devos et al., 2019c; Smith et al., 2019; Zollo, 2019). The political, economic and technological transformation of contemporary societies is challenging conventional structures and approaches in these areas. Social science expertise can help to define more impactful public information strategies and to better engage stakeholders and citizens to strengthen regulatory science. In order to make effective use of new scientific approaches and advances, engagement between food safety risk assessment experts and other stakeholders is needed (Smith et al., 2019). The main purpose of risk assessments at EFSA is to inform decision-making by policymakers/risk managers using the most up to date science. As described by Devos et al. (2019c), the interplay between science, risk assessment and policy has always been complex, and even more so in the so-called 'post-truth' world in which scientific facts are often dismissed or ignored. At this challenging time, risk managers should effectively navigate the interplay between facts and values and be able to rely on robust and fit-for-purpose risk assessments to aid them.

5. Staying relevant in a changing world

Some of the commendations from the third EFSA conference, which build on those identified during the 2015 EFSA conference (EFSA, 2016; Robinson et al., 2016), can be grouped under the current and still very relevant, five Strategic Objectives of the EFSA Strategy 2020:

- 1) Strategic Objective 1 (Prioritise public and stakeholder engagement in the process of scientific assessment): to work within the new communication landscape; to play an active role at global level as consensus builder; and to increase cooperation and engagement with relevant stakeholders;
- 2) Strategic Objective 2 (Widen EFSA's evidence base and optimise access to its data): to further develop EFSA into an Open Science organisation; to optimise the access to and use of data/information, tools/methods and expertise; and to prepare EFSA for the big data future.
- 3) Strategic Objective 3 (Build the EU's scientific assessment capacity and knowledge community): to focus on cooperation, collaboration, training, communication and sharing of expertise; and envisage ways to co-design and possibly co-produce work, in line with the One Health/One Environment objectives at EU level; to harness the wisdom of the crowd; and to proactively contribute to shaping the research/innovation agenda at European and Member State level;
- 4) Strategic Objective 4 (Prepare for future risk assessment challenges): to further explore new/future tools/methods for risk assessment purposes, including the risk assessment of the combined effect of multiple chemicals in food, and approaches that facilitate more comprehensive assessments, which integrate risk and benefit assessment across multiple stressors, scales and policies/legal frames and the application of the ecosystem services approach; to investigate how dietary guidelines should evolve to address diet-related chronic metabolic diseases including research on personalised nutrition and the microbiome and also addressing the psychological, social, economic and cultural factors that influence eating patterns; to develop the capabilities to proactively identify potential emerging risks; and to promote a paradigm shift in toxicity testing so as to reduce animal testing;
- 5) Strategic Objective 5 (Create an environment and culture that reflects EFSA's values): to deliver the best possible risk assessments and scientific advice to risk managers, based on the most up to date and best quality science, focusing on issues that are in the remit of EFSA's current mandate; and to further explore how post-market monitoring, surveillance and vigilance should be best designed to deliver more informative data for future risk assessments.

While delivering on the current strategic objectives and associated recommendations, EFSA's challenge is to produce better and more visionary regulatory/scientific advice that incorporates societal views using state of the art developments in science, communication and stakeholder engagement. When doing risk assessment, problem formulation is the pivotal first step. Here, EFSA's challenges are to improve the dialogue between risk assessors and risk managers on the definition of specific protection goals, judge the sufficiency of scientific knowledge and to what degree uncertainties need to be identified, as part of problem formulation. It is advocated to use problem formulation as the critical first step of risk assessment to identify relevant and reliable information for risk assessment.

Science progresses rapidly all the time. The availability of data increases, the methodologies of risk assessment improve and develop constantly, the whole world is a stakeholder, and communication is done at a different scale and in many different new ways.

As such, EFSA needs to pursue its work on developing methodologies for the risk assessment of the combined effect of multiple chemicals in food, as this is essential to ensure that the risk assessment reflects consumers' 'real life' exposure. This may be particularly relevant in the context of a circular economy where the lifecycle of substances becomes more complex, thus creating more complex exposure scenarios. EFSA needs to further explore the strengths and limitations of new/future tools/methods (e.g. profiling techniques, genomics, biomarkers, digitally enabled tools, artificial intelligence) for risk assessment purposes, and consider development needs for their practical implementation.

EFSA needs to communicate better and to collaborate more with others to support the transition towards a One Health/One Environment approach at EU level, as identified for instance in the area of antimicrobial resistance (European Commission, 2017), and to continue its transformation to an Open Science organisation.

In summary, the three pillars on which the Conference was based enabled debate and provided recommendations that will inform the next EFSA strategy:

- *Food*: strive for robust and fit-for-purpose risk assessments; consider food in the context of safety, nutrition and sustainability; and explore further how EFSA can work with other organisations to achieve the One Health/One Environment goals,
- *Science*: base scientific risk assessments on reliable science while capitalising on scientific advances; address scientific uncertainties; and fully publish the evidence and data used,
- *Society*: frame risk assessments through clear policy goals and problem formulation; be explicit about value judgements; communicate clearly and consistently and in coordination with risk assessors and risk managers; involve society; avoid conflicts of interest; and follow trustworthy processes.

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Abbreviations

- ERA environmental risk assessment
ES ecosystem services
FAO Food and Agriculture Organization of the United Nations
SDG Sustainability Development Goal