

Summary of the 14th annual symposium of the Scientific Committee established at the Federal Agency for the Safety of the Food Chain on Big Data in the Food Chain

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On December 4th, 2018, the Scientific Committee¹ established at the Belgium Food Safety Agency held its 14th annual symposium at the Pachéco auditorium in Brussels. This year, the theme was dedicated to *big data*, with the title: '*Big data in the Food Chain: an un(der)explored goldmine?*'. After first stating *big data* into perspective within the so-called *Data Sciences*, the current or potential uses of the large sets of data produced throughout the food chain were discussed by national and international experts. This discussion focused on the perspectives of risk assessment and management, traceability, georeferencing for plant and animal health, fraud detection, the possibilities offered by *in silico* analysis in toxicological evaluation of substances and predictive source and impact models of foodborne outbreaks via data on international trade flows. The contributions and challenges of innovative concepts such as *blockchain*, *Graph Databases* and *Citizen Science* were also discussed.

Big data is often seen as the black gold of the 21st century. However, applications of *big data* are still under-explored in the food chain. In fact, a very small percentage of the large sets of data produced throughout the food chain are structured or organised in such a way they can be easily exploited. The aim of the symposium was to show that the analysis and the advanced use of *big data* represent opportunities and challenges for all the actors throughout the food chain. The symposium also aimed to stimulate new developments and projects regarding risk assessment and risk management in the food chain, bringing together the main actors in food safety and the scientific world around a topic that is particularly relevant today.

The first speech ('**Mining Spaghetti and Lasagne Processes: Bridging the Gap Between Data Science and Process Science**') was given by **Professor W. van der Aalst** from the University of Aachen in Germany, a leading international expert in data science. He started by metaphorically recalling how, over the past two or three decades, data generation around the world has gone from being a small trickle of water to a dizzying and constant cascade. There are now huge quantities of data, for which the storage (in the form of 'data lakes' or 'data warehouses') and processing are currently a true challenge, even for leading institutions. From a structural point of view, the processes can be divided into two main types: '*spaghetti*' processes and '*lasagne*' processes. He went on to demonstrate how the study of processes within organisations and industrial sectors can help the latter detect errors, make these processes more fluid, and even solve 'the unknown unknowns' (to paraphrase D. Rumsfeld) and, consequently, optimise

¹ The Scientific Committee is an advisory body established at the FASFC composed of 22 members appointed by Royal Decree, which provides independent scientific advice on risk assessment and risk management in relation to the competences of the FASFC, inter alia on (emerging) risks in the food chain (food, feed, animal health and plant health); all draft laws and royal decrees relating to risk assessment and risk management in the food chain, animal health and plant health; analysis and inspection programmes and sectoral self-checking guides.

their activities. It was highlighted that whereas Europe has traditionally been a leader in *process mining*, it was now lagging behind its global competitors, a trend which is strategically urgent to reverse.

Mr **F. Robben**, Managing Director of Smals ICT Service provider, unravelled the shroud of mystery covering blockchain, a concept that is becoming more and more common, although it probably remains somewhat obscure to the uninitiated (**'Blockchain: concept, critical success factors and possibilities in the food chain'**). This emerging technology is not disruptive but would instead appear to have a founder effect. It needs to be adopted gradually in economic and social systems, without challenging current models as the low-cost solution to all their problems. This technology offers various properties, of which transparency, integrity and authenticity are clearly of interest for some of the current challenges in the food chain. However, there are still various unknowns regarding its future, particularly in terms of what is known as the progressive archiving of chains (so as not to overburden the processing and calculation capacities that they imply from the machines). The use of blockchain as an operational solution for recording and sharing data must always be subject to a prior cost-benefit/risk-gain analysis, in particular according to the context within it should be implemented. While blockchain would possibly be well-adapted to certain decentralised contexts, it would be much less relevant or even costly and complex in a centralised operational context (where the question of trust in the central entity is not a prerequisite or a primary element). In addition, any gain in transparency automatically transfers constraints on confidentiality. Even if systems for encrypting personal data within the chain would make it possible to reduce these constraints, blockchain clashes in conceptual terms with the GDPR (*General Data Protection Regulation*).

Then Professor **G. Poppy**, Chief Scientific Advisor to the *Food Standards Agency* (FSA, United Kingdom) detailed some representative examples on how the FSA currently incorporates data processing and data use into its food security strategy (**'When data science meets food safety'**). He highlighted the following examples:

- The *Food Hygiene Rating Scheme*, a rating system for operators which combines the results of their inspections and promotes the proactivity of the sector towards food safety;
- Blockchain, used in the cattle slaughterhouse sector to limit/facilitate administrative work and enhance the transparency and authenticity of checks and inspections;
- Social media monitoring, for early signal detection ("*horizon scanning*" in vigilance and syndromic surveillance);
- The digitisation of conformity checks in the food chain, for administrative simplification and automation of data storage and data processing.

Several presentations were then given to illustrate potential applications of data processing in various sectors of the food chain:

- Dr **C. Brewster** (TNO, Netherlands, **'The potential of blockchain technologies in food safety'**) provided a new critical analysis on blockchain and a reaffirmation that this technology is not necessarily THE universal solution to all the problems of the food chain, since the food chain is often too complex for blockchain technology to be applied to all of these components (blockchain can only be effectively applied to relatively closed sectors of the food chain);
- Dr **S. Van Weyenbergh** (ILVO, **'Data value chain in the dairy production: opportunities and challenges'**) on how the data recorded in the dairy sector can currently be used for its

valorisation, although the connection of dairy data is sometimes still hampered by ownership and confidentiality issues;

- Professor **P. Fernandez** (Polytechnic University of Cartagena, Spain, '**Spread model: a forecasting and managing tool in microbiological safety**') presented a tool based on statistics on the import and export of food products at Member State level, making it possible to rapidly identify those that could be particularly vulnerable in the event of a food-borne outbreak in one of these Member States or, *conversely*, those that could potentially be incriminated in the event of an outbreak in a country (and as a corollary, their likely origin);
- Professor **P. Defourny** (UCLouvain, '**Smart imaging from space for crops management**') showed how multiple data produced by the European Copernicus space programme (satellites) currently enable the agricultural world to manage its yields and offer European organisations (more or less) real time control possibilities on agricultural grants (monitoring plant diseases is not yet technologically possible but could certainly constitute a challenge for future development);
- Dr **E. Ducheyne** (Avia-GIS, '**Smart imaging for vector-borne diseases management**') showed how the same spatial data can also be used for animal health, for example by detecting breeding sites for insects responsible of various vector-borne diseases (the selected example concerned the location of the most suitable biotopes for the reproduction of the intermediate host of the bovine parasite *Fasciola hepatica*);
- Professor **M. Wright** (University of Newcastle, United Kingdom, '**OMICs in food safety: contribution to chemical risk assessment**') presented the contributions of *in silico* (bioinformatics) analysis in toxicology, known as "OMICS" (genomics, transcriptomics, proteomics, metabolomics). He also showed that, in the context of animal welfare and reduced laboratory animal testing, these technologies hold great promise, even if they still have limitations and a lack of standardisation of protocols for a full toxicological analysis of potentially harmful substances.

Finally, **Dr V. Van Vlasselaer** (SAS institute, '**Gotcha! Network analytics for Fraud Detection**') and Professor **F. Meysman** (UAntwerpen, '**Unlocking the power of citizen science**') presented two perspectives on data representation and data collection. 'Graph databases' are an alternative to the common structuration of data in tables. They offer the possibility of saving computing time and of a more efficient representation of the existing relationships between entries of a database. As such, they currently offer an interesting opportunity in the fight against fraud by tackling it from a sociological perspective via the relationships between the fraudsters.

'Citizen science' is an emerging way to collect data in the future Science. In addition to its aspects of awareness-raising, participation and responsibility of citizens towards their environment and the organisation of the societies in which they live, citizen science offers to organisations a new form of close collaboration with citizens, with a mutual aim of increasing and optimising the collection of field data. This concept could be particularly useful for all food safety agencies as part of their communication strategy, and in building a relationship of respect and mutual trust with consumers.

The symposium made it possible to identify ongoing projects, to ensure a rational and reasonable use of the quantities of data produced throughout the food chain. The opportunities are there and must be seized upon to guarantee the food security of citizens more effectively and efficiently in the future.

The complete proceedings and presentations of the 14th symposium can be consulted at the website of the Scientific Committee of the FASFC at <http://www.afsca.be/scientificcommittee/symposia/>