

The International Feed (Safety) Conferences from 2004 up to now: evolution and challenges

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The series of International Feed Conferences started in 2004 in Namur (Belgium) with the **1st International Feed Safety Conference**, dedicated to “Food and feed safety in the context of prion diseases”. This conference was organized by the Walloon Agricultural Research Centre (CRA-W), European Commission’s Joint Research Centre – Institute for Reference Materials and Measurements (JRC-IRMM), the Belgian Federal Agency for the Safety of the Food Chain and Agrobiopôle in the framework of the European research project STRATFEED “Strategies and methods to detect and quantify mammalian tissues in feedingstuffs”. This initiative of Vincent Baeten and Pierre Dardenne (CRA-W) is gratefully acknowledged.

The conference included sessions about:

- general aspects;
- TSE overview and legislation;
- analytical methods for food of animal origin;
- analytical methods for feed focusing on the detection of banned meat and bone meal;
- prevention and technical aspects.

Next to scientific institutes and universities, among others the European Commission, industry associations (the European Fat Processors and Renderers Association; EFPPA) and risk assessment bodies contributed to the success of this event.

The **2nd International Feed Safety Conference** was organized in 2007, again in Namur, and was organized by CRA-W and Agrobiopôle in the framework of the European research project SAFEED-PAP “Detection of presence of species-specific processed animal proteins (PAPs) in animal feed”. While results of scientific research on the detection of PAPs were the main topic, the scope of the conference was already broadened to many other feed safety related topics, such as:

- the role of the Community Reference Laboratories (CRLs) & National Reference Laboratories (NRLs) networks, viz. next to CRL-Animal Proteins (CRA-W) also the CRL’s for feed additives and mycotoxins, both located at JRC Geel;

- European harmonization: CEN TC327 - Animal feeding stuffs - Methods of sampling and analysis, chaired by RIKILT – Institute of Food Safety;
- Belgian Dioxin crisis - lessons learned;
- detection of banned antibiotics and growth promoters in feed; the SIMBAG-FEED European research project
- cross-contamination in feed technology.

The **3rd International Feed Safety Conference** was organized in 2009 in Wageningen, The Netherlands and was hosted by RIKILT – Institute of Food Safety, part of Wageningen University & Research.

The conference was again organized in the framework of the EC supported project SAFEED-PAP and in collaboration with the COST action FA0802 “Feed for Health”.

While JRC-IRMM and RIKILT – Institute of Food Safety were already involved in the organization of the 1st and 2nd conference, this was the first conference organized by the Feed Safety Platform, created in 2006 by CRA-W (Vincent Baeten, Pierre Dardenne and Philippe Vermeulen), JRC-IRMM (Christoph von Holst and Ursula Vincent) and RIKILT – Institute of Food Safety (Jacob de Jong and Leo van Raamsdonk). This platform aims to gather institutes, universities and other stakeholders that play a key role in the use, development and validation of analytical methods for the feed sector and for official control (<https://www.feedsafety.org/>).

The scope of the conference was broadened to all aspects of feed safety, covering among others contaminants (*e.g.* dioxins, heavy metal speciation), feed additives (*e.g.* mycotoxin adsorbents), impact of the safety of feed on food safety, risk assessments of contaminants and PAPs, the legislative framework, nanotechnology and consequences of feed medicated with antibiotics on the occurrence of antimicrobial resistance. This broad scope was also reflected by (keynote) contributions from among others the European Commission (DG for Health and Consumers (DG SANCO) and DG RESEARCH),

the European Food Safety Authority (EFSA), the European Feed Manufacturers Federation (FEFAC), the EU Association of Specialty Feed Ingredients and their Mixtures (FEFANA), the Food and Agriculture Organization (FAO) and EFRA.

In a dedicated session, the results of the EC-funded RTD project SAFEED-PAP were presented. This included among others: a PCR-method for the species specific detection of MBM in feed; identification of animal origin using soft-ionization MS; a Near Infrared Microscopy (NIRM) method for identification of markers and new developments in classical microscopy, related to official control.

In a special session, the results of the COST action “Feed for Health” were presented, including feed safety in the supply chain, chain modelling for contaminants in feed and traceability in the feed chain.

The **4th International Feed Safety Conference** was organized in 2012 in Beijing, China and was hosted by the China Agricultural University (CAU). The conference was organized by CAU, Queen’s University Belfast and the Feed Safety Platform partners.

The scientific program addressed areas such as organic contaminants and adulterants, processed animal proteins, feed additives, banned substances, heavy metals, mycotoxins, plant toxins, veterinary drugs and Genetically Modified Organisms.

With regards to organic contaminants, the programme included among others an update of the EU policy on contaminants in feed and transfer of dioxins and PCBs from feed to food of animal origin.

With regards to processed animal proteins, among others Real-Time PCR as official method of detection was presented.

An important topic was the upcoming development and use of rapid methods for feed safety. This included among others ELISA screening tests for plant toxins, notably pyrrolizidine and tropane alkaloids; *Fusarium* mycotoxins dipstick screening test in wheat and maize; NIR hyperspectral imaging for ergot sclerotia in cereals; methods of analysis for perfluorinated alkylated substances (PFAS), an emerging class of persistent organic pollutants, in fish feed; flow cytometry-based immunoassay (FCIA) for cross-contamination levels of coccidiostats. These results were obtained in the framework of the EC-funded RTD project CONFIDENCE “Contaminants in food and feed: inexpensive detection for control of exposure”.

A new, challenging topic was authenticity and fraud. This included among others the detection of melamine as an adulterant in feed materials with NIR Spectroscopy and NIR Microscopy, the determination of the geographical origin of distillers’ dried grain with solubles (DDGS) with FT-IR spectroscopy and proton-transfer reaction mass spectrometry (PTR-MS) and

the semi-targeted detection of unknown contaminants applying GC(xGC)-ToF-MS. These results were obtained in the framework of the EC-funded RTD project QSAFFE “Quality and Safety of Feeds and Food for Europe”.

Other topics included, among others: the feed and feed additive assessment system in China; risk-based monitoring of contaminants and mycotoxins in feed materials, based on trend analysis and transfer from feed to food; microbiological quality of feed; detection of remnants of packaging material in former food products.

The **5th International Feed Conference** was organized in 2016 in Geel, Belgium and was hosted by the European Commission’s Joint Research Centre, Geel site (former JRC-IRMM). The conference was organized by the Feed Safety Platform-partners.

The name of the conference was changed from Feed Safety Conference to Feed Conference, not because feed safety was no longer important, but because other topics, such as feed security and feed traceability/authenticity became more important. For the first time dedicated sessions were organized about:

- new feed materials and Security;
- traceability/authenticity of feed materials, including additives.

The first session included among others contributions about valorization of food by-products, including nutritional evaluation, and insect products as new feed source. In the latter session among others the possibilities of spectroscopy (NIR, Raman) for traceability and authenticity of feed additives and feed materials were demonstrated and the application of microtracers and biological tracers was presented.

The major contributions from the feed industry (among others FEFANA and FEFAC) were reflected in a special session (first time!) about the industry perspective. Among others, regional, national and international initiatives from the feed industry to safeguard feed safety, including feed safety assurance systems and schemes were presented.

The scientific program also addressed areas such as the outcome of the recent Joint FAO/WHO expert meeting on chemical, biological and physical hazards in feed; an analytical strategy for the early quality and safety assurance in the global feed chain; the natural occurrence of chloramphenicol in cereal straw; computational toxicokinetic modelling of contaminants in feed and food.

The **6th International Feed Conference** was organized in 2018 in Bergen, Norway and was hosted by the Institute of Marine Research (IMR), Bergen, Norway. The conference was organized by IMR and the Feed Safety Platform partners.

Hosting the conference in Norway gave a unique opportunity to focus on aquaculture in addition to agricultural feed production. The aquaculture sector is a fast growing food-producing sector with a rapid implementation of novel feed ingredients that requires new risk assessment and development of legislation. The program included among others options for obtaining more food and feed from the ocean (keynote lecture); species specific discrimination of insect protein in aquafeed using proteomic tools; safe limits of selenomethionine and selenite supplementation to plant-based Atlantic salmon feeds; kinetics and effects of deoxynivalenol and ochratoxin A in dietary exposed Atlantic salmon; growth, skin and gut health effects of variable essential amino acid, micromineral and vitamin supplementation in low fish meal diets on Atlantic salmon smoltification and post transfer performance.

Just like in the 5th conference, new feed materials and security, traceability/authenticity and the industry perspective were important topics - and thus sessions. Keynote lectures were given about analytical challenges for ensuring feed integrity and the FEFAC vision 2030 and key priorities. Other lectures were about *e.g.* heavy metal and mycotoxin excretion/accumulation in insects for feed and food and new approaches for the authentication of feed – study on the differentiation of the geographical origin of grain maize by spectroscopic methods.

Regarding processed animal proteins and blood products in feed, results were presented about species and tissue differentiation, applying immunoaffinity-based mass spectrometry and UHPLC-MS/MS.

The **7th International Feed Conference** was organized in 2021 as an on-line event. Originally, the conference was scheduled for June 2020 in Vienna, Austria but due to the Covid-19 crisis it had to be postponed until June 2021 and then was organized as a virtual conference. The conference was hosted by the Austrian Agency for Health and Food Safety (AGES). The conference was organized by AGES, the Feed Safety Platform partners, IMR and the University of Milan, Faculty of Veterinary science, Italy (host of the next conference).

Compared to the earlier conferences, the scope of the conference was further broadened to highly relevant societal challenges such as climate change, sustainability/circular economy and animal health/welfare. For the first time, dedicated sessions were organized about:

- Natural Toxins & Climate Change;
- Impact of Feed on Animal Health & Welfare;
- Sustainability & Circular Economy.

Within these sessions, keynote lectures were given about: How to tackle natural toxins in view

of globalisation and climate change; Feed - Impact on physiology, health and welfare of farm animals; FEFAC Charter 2030: A comprehensive view on sustainable feed production. Other lectures concerned among others: Mycotoxin risks in stored Swedish grain; Classification of the maize assortment regarding the susceptibility to ear fusariosis; Mitigation of mycotoxin exposure with feed enzymes; Speciality Feed Ingredients' contribution to sustainable animal farming/pivotal role in the fight against Antimicrobial Resistance; Effects of confectionary or bakery former food products as cereal substitute on growth performance in post-weaning piglets; Connecting agri-food supply chains through insect farming: upcycling underused materials into animal feed ingredients.

Feed safety was still an important topic of the conference. This was reflected by two keynote presentations about: Past and present challenges on the safety and efficacy assessment of feed additives; Update and outlook on regulatory developments and enforcement of feed safety at EU levels, with focus on undesirable substances in feed. Other lectures concerned among others: Whole genome sequencing of microbial contaminants; Microbiological testing for *Salmonella* spp. and Enterobacteriaceae in field samples; Detection of microplastic in feed ingredients; Application of the HRMS-QExactive for the development of a comprehensive mass spectral database for pyrrolizidine alkaloids; Determination of cross-contamination levels for antimicrobial active substances regarding new EU-legislation. The outcome of a Joint FAO/WHO Expert Meeting in 2019 regarding carry-over in feed and transfer from feed to food of unavoidable and unintended residues of approved veterinary drugs was also presented.

Regarding feed authenticity/fraud a keynote lecture was about enforcement of EU feed legislation with specific focus on truthfulness of feed labelling and feed fraud. Among others, lectures were presented about: DART mass spectrometry: A rapid tool for the identification of feed additives; Vibrational spectroscopy and imaging coupled with chemometrics for the authenticity of protein feed: the example of antibiotic mycelia residues.

The present proceedings provide a reference book reporting the state of the art of some of the key research issues in 2021.

CONCLUSIONS

Summarizing, it can be concluded that from the start in 2004 up to now, the International Feed Conference has evolved and covers now all relevant societal and scientific challenges. Next to feed safety, which still is an important topic, sustainability, climate change,

animal health and welfare, authenticity and fraud are also covered.

The commitment of many leading scientific institutes and universities, the European Commission, risk assessment bodies such as EFSA, feed industry associations and other stakeholders such as FAO/WHO ensures a high level of the conferences and state of the art presentations.

Most of the lectures and posters presented during those events can be viewed on the Feed platform website <https://www.feedsafety.org>

FUTURE CHALLENGES

During the past 18 years, many important achievements have been made. However, emerging societal challenges ask for new research and implementation, new strategies and alternative approaches. New challenges include among others:

- contribution of feed to sustainability, viz. the use of new by-products from agro-food industry but also from other sectors like water production, 2nd and 3rd generation biofuel production. Important aspects are the safety of these new by-products and nutritional aspects. Due to safety reasons, some specific by-products will not be suitable as feed materials, and thus should be treated as waste; this means that authenticity and traceability will also be an important issue;
- circular economy and circular agriculture, which are important pillars of sustainability. Again, an important aspect is that the safety should be guaranteed in terms of chemical, microbiological and physical contaminants. Accumulation of persistent contaminants should be prevented;
- alternative protein sources, such as insects and algae. Important aspects are the safety of these new products but also their production and nutritional aspects. For insects, an important issue is to know if (by-)products, that are not allowed for direct feeding, will be allowed as substrates to grow insects;
- in order to decrease the import of *e.g.* soybeans and soybean products from other continents, the

possibilities of locally produced feed crops, such as lupines are investigated. Safety aspects, *e.g.* the content of plant toxins/anti-nutritional factors, nutritional aspects and authenticity, viz. determination of the geographical origin are important;

- the potential of feed ingredients (*e.g.* herbs and herbal products) and feed additives to promote physiology, health and welfare of farm animals and aquatic species, thus reducing the use of antibiotics;
- climate change: the potential of feed ingredients and additives in reducing emissions of greenhouse gases such as methane. New products are under development and should be checked for their safety and efficacy;
- environmental policies: it is envisaged that legal measures will be taken to further protect the environment by reducing the possibilities to use agrochemicals, *e.g.* pesticides. This could have implications on the levels of *e.g.* mycotoxins or plant toxins.

POST SCRIPTUM

It was a great pleasure and honor for me to be one of the organizers of the series of International Feed (Safety) Conferences, right from the start in 2004. As a participant, I really enjoyed the good atmosphere and excellent spirit of the conferences. The first conferences were organized in the framework of EC-funded RTD projects by the core group of Feed Safety Platform partners CRA-W, JRC Geel and RIKILT – Institute of Food Safety (after a merger in 2019, the name changed to Wageningen Food Safety Research). Starting from the 4th edition, other leading feed research institutes and universities from Europe and China joined the scientific committee and hosted the conferences. I am convinced that the consortium is in a good position to play a key role in the scientific communication and solutions regarding the challenges of today and tomorrow. I wish you good luck!!!