

Foreword

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In the framework of the SAFEED-PAP project “Detection of the presence of species specific processed animal proteins in animal feed” (<http://safeedpap.feedsafety.org/>), funded by the 6th Framework Programme of the European Commission, the 3rd International Feed Safety Conference – Methods and Challenges – took place on 6-7 October 2009 in Wageningen, The Netherlands.

The conference was organized by RIKILT - Institute of Food Safety, part of Wageningen University and Research Centre (NL) in close collaboration with the COST action “Feed for Health - FA 0802” (<http://www.feedforhealth.org/>), Working group 2 – Feed Safety and Working group 3 – Feed Supply. The purpose of the conference was to present the state of the art and to discuss future challenges with regards to detection, risk assessment and legislation in the context of the safety of the feed chain. Over 140 people attended the conference, originating from 25 countries throughout the world. The 31 lectures and the 42 posters presented during this event can be viewed on the SAFEED-PAP website (<http://safeedpap.feedsafety.org/fs2009/>). A video including a photographic impression of the event can be downloaded as well.

These proceedings aim to be a reference book reporting the state of the art of a number of key research issues in feed safety topic.

Feed supply and feed safety are intimately linked due to the fact that the origin, processing, handling and storage of feedingstuffs as well as many other factors related to the market can affect both the quality and safety of feed at different levels. The first section covered by these proceedings addresses aspects concerning the feed supply chain and how it can affect feed safety among others in the context of the aquaculture production and also in the context of the competition between food, feed and fuel sectors for agriculture raw materials. All these issues are studied in the framework of the COST Action Feed for Health.

The second section relates to “processed animal proteins (PAP)” and to results achieved in the framework of the SAFEED-PAP project. The official control of animal proteins in feed is focused on the prevention of Bovine Spongiform Encephalopathy (mad cow disease). According to current and future legislation of the European Union it is not allowed to feed animals with by-products coming from the same species (ban on intra-species recycling). With respect to the official control, the purport of the term *species* in legislation should be defined, and species-specific markers should be available. Markers could include the use of oligonucleotide primer sets, antibodies, near-infrared profiles or visual characteristics. The method of classical light microscopy is currently the only accepted method for the official detection of animal proteins. Besides the necessary development of complementary methods, either as stand-alone methods or in combination, the visual characteristics used for a microscopic examination of meat and bone meal particles should be fully explored. Regarding the immunological methods, the currently available immunological lateral flow assays are not sensitive enough to detect the presence of ruminant animal material below 1% level of contamination in feed. A new protein extraction method with the aim to increase the sensitivity of dipstick methods is in development. Also techniques as the Near Infrared Microscopy have been studied in order to propose fast and non destructive alternatives for the detection of PAP. This book shows some of the results achieved through the EU SAFEED-PAP project, regarding the improvement of the official optical microscopic method as well as the improvement of the protein extraction method used for the immunological dipstick assays.

The third section concerns contaminants such as dioxins, undesirable botanical impurities and heavy metals (arsenic, mercury and cadmium).

In 2006, new maximum levels for the concentration of dioxins (PCDD/F) and dioxin-like PCBs in food entered into force in the European Union. The Swiss Confederation decided to adopt these values from the 1 January 2009. A previous appraisal showed that beef from extensive production systems in Switzerland may exceed the new maximum level of 4.5 pg WHO₉₇-TEQ·g⁻¹ fat. In order to identify the reasons of the presence of dioxins (PCDD/F) and dioxin-like PCBs in Swiss beef, a detailed survey reported here was conducted on eight farms in 2008. Weed seeds may pose risks as undesirable substances in feed. *Ambrosia* sp. are among the emerging invasive weed seeds in Europe. For that reason a survey was started in Switzerland in 2005, to check bird feed and raw materials for the presence of *Ambrosia* sp. seeds. Indeed, such seeds were found in varying amounts when analyzed by feed microscopy. The results of five years of control in an European scope are summarized in this contribution.

The supply of safe feed products to animals is crucial, not only to safeguard animal health and welfare but also to reduce human exposure to potentially toxic compounds like heavy metals. Transfer of heavy metals from feed into consumable animal products, like meat, liver and kidney, can contribute substantially to human intake of these compounds. Control in every stage of the feed supply chain is needed, starting at the initial source of contamination and covering all other relevant stages of the feed chain. The maximum allowed concentrations for the total content of arsenic, mercury and cadmium in feed are regulated in EU legislation, but the toxicity of these elements primarily depends on the chemical form in which these elements are present. In the framework of the CONFIDENCE project, simplified methods of analysis under development are dedicated to speciation of the toxic forms of arsenic and mercury, namely inorganic arsenic and methylmercury. In these proceedings an overview of analytical methodologies for arsenic and mercury speciation analysis is given.

In another contribution, quantitative supply chain modeling was applied to study the transfer of cadmium from soil through fodder (maize and grass) to cattle organs (liver and kidneys). Cadmium levels in cattle organs were calculated for different scenarios related to soil characteristics and two different model assumptions regarding accumulation in cattle. This study showed that quantitative supply chain modeling is an effective tool in assessing whether or not a specific combination of soil properties would lead

to unacceptable contaminant levels in feedstuffs and animal products in the view of animal and human health.

A major aim of food researchers and producers is to increase the nutritional value of food by means of enrichment of feed with feed additives, without decreasing sensory quality or consumer's acceptability. This is the fourth and last section of these proceedings. Currently there is a focus on the development of functional poultry products capable of enrichment by selenium, vitamin E, iodine and fatty acids. Selenium has been defined as an essential dietary supplement which is important for improving health and performance of the birds and improving meat quality for human consumption. The effect of different amounts of selenium in diet of broiler chickens on the sensory and technological attributes of chicken meat has been investigated and the results are presented in this section.

More information about feed safety can be found on the website of the Feed Safety Platform (<http://www.feedsafety.org>), an initiative from the Walloon Agricultural Research Centre (CRA-W), the Institute for Reference Materials and Measurements of the European Commission's Joint Research Centre (JRC-IRMM) and RIKILT-Institute of Food Safety. This website provides an overview of all major feed safety issues: animal by-products, feed additives, banned additives, GMOs, veterinary drugs, botanical impurities, mycotoxins, heavy metals and dioxins. It includes aspects on legislation, analytical methods, available tools and publication libraries. This website also offers links to European and national projects related to feed safety, among others SAFEED-PAP (Detecting animal proteins in feed), <http://safeedpap.feedsafety.org/>, CONFIDENCE (Contaminants in food and feed: inexpensive detection for control of exposure), <http://www.confidence.eu/> and the COST action "Feed for Health - FA0802", <http://www.feedforhealth.org/>. Links to relevant European Union Reference Laboratories, such as the EURL-AP (European Union Reference Laboratory for Animal Proteins in feedingstuffs), <http://www.eurl.cra.wallonie.be/>, are also given.

The conference provided a large and diverse amount of information on the topic of feed safety in a broad sense. These Proceedings are published to provide that information to a wide audience, also for all those researchers, legislators, stakeholders and other persons interested who were not able to attend the conference. The organizing committee wishes to thank for all the support received from a large range of colleagues. Have a nice reading time.