

curité Sanitaire des Aliments pour Ani

Monitoring

CONTAMINANTS, WHAT CHANGES CAN BE EXPECTED?

nimal feed regulations change constantly and 2024 will be marked by a certain number of publications that will affect the monitoring carried out on feed materials and compound feed.

THE DIRECTIVE 2002/32 AS AMENDED SHOULD BE PUBLI-SHED IN AUTUMN 2024

For several years, the legislators have worked on the amendment to this directive, which sets the thresholds for undesirable substances in animal feed. During the latest discussions, the authorities confirmed a movement towards the changes planned for several months.

Among the main changes that the text will provide, we can cite a two-fold reduction in the threshold for **ergot sclerotia and datura**, thus setting the new limit at 500 mg per kg for these two contaminants (with exceptions).

In the 2023 feed plan, 45 searches for ergot sclerotia were carried out. All the results will comply with the envisaged threshold (maximum value: 215 mg/ kg on rye). The results for datura are similar: the level is lower than 500 mg/kg for the 68 analyses carried out (maximum value: 100 mg/kg for corn).

The organochlorine pesticides and dioxin and dioxins + dioxin-type PCB for animal-origin feed materials (MP) and fish products should see their maximum levels revised downwards.

With regard to heavy metals, new thresholds should be set, notably a maximum level of nickel at 20 mg/kg for fatty acid- and glycerine-based MP, and a threshold for inorganic arsenic for different algae and fish-based MP and products. Certain additives will be concerned by an upwards revision in thresholds, such as cadmium in copper oxide with a threshold at 15 mg/kg instead of 10 mg/kg. In the supplement plan, in 3 years, around twenty results have been pooled on this couple; the average result is 2 mg/kg, with a maximum result of 3.5 mg/ kg and a minimum of 0.01 mg/kg.

Among the sensitive points, the addition of maximum limits for $\Delta 9$ -THC in hemp-based MP and compound feed is an issue for sector operators. Note the transition periods provided in the revision draft: 3 months for placing feed produced before the entry into force of the text on the market, and 6 months for their use. While this does not generate real difficulties in the case of bulk feed, these requirements must nevertheless be anticipated. In order to facilitate the application of these changes, the amended Directive provides, however, for an entry into application on 1 January 2026 for ergot sclerotia and 1 October 2025 for datura.

MYCOTOXINS: A REVISION TO RECOMMENDATIONS

The recommendations 2006/576 and 2013/165 concerning mycotoxins are also being revised and should lead to the adoption of new versions by the summer.

Numerous values are being lowered and maximum recommended levels will be added for MP, which did not have them up to now. A fairly low threshold of 2.5 mg/kg should be set for DON for soy-based MP.

The limits set for compound feed remain maximum recommended levels and will not become maximum regulatory limits, as could have been envisaged. The balance of responsibilities between the links will be preserved. However, the authorities will reinforce the concept of "maximum recommended level". If the thresholds are exceeded, there will be a presumption of danger. A risk analysis and explanation of management measures (dilution of batches...) should be requested in the event of exceeding thresholds.

AND BEYOND...

Other recommendations are still being prepared on:

Plans

Journa

MAY 2024

- PFAS
- Pyrrolizidine alkaloids in fodder, grass, grass mixtures and plant extracts and compound feed containing them (note, these alkaloids were incorporated into the 2024 feed plan on the dried alfalfa and sainfoin matrices)
- Quinolizidine alkaloids in lupin seeds and derivative products
- Hydrocyanic acid in flax seeds

And with regard to pesticides? A working group was constituted at the level of the authorities to prepare recommendations on the use of the footnote of regulation no. 396/2005.



1 / The footnote on page no. 1 of part A of the Regulation 396/2005 stipulates that the MRLs, set in annexes II and III, do not apply to products or part of products that by their characteristics and nature are used exclusively as ingredients of animal feed, until separate MRLs are set in the specific category 1200000 "Products or part of products used exclusively for the production of animal feed".



OQUALIM is an association whose aim is to provide solutions to help meet **health security and animal feed quality challenges**. The association coordinates the collective approach by the French animal nutrition sector in terms of quality and health safety of animal feed. It has two main objectives: health security and compliance with both public and private specifications. To achieve these objectives, it has constructed two tools: pooled self-monitoring plans and the certification of animal feed plants with the RCNA (Animal Nutrition Certification Reference).

MYCOTOXINS | What challenges to support with control and monitoring plans?

CHARACTERISING THE MYCOTOXIN DANGER

The presence of mycotoxins in feed destined for human or animal consumption is potentially dangerous due to the toxic effects of certain substances, with effects on growth, endocrine disrupters, immuno-hepato-haemato-embryo-toxic, teratogenic, carcinogenic effects. In human food, while exposure to certain mycotoxins can exceed the benchmark toxicological values, the concern is mainly on the long-term effects of exposure to low doses, or chronic toxicity. Mycotoxins are generally thermostable, they are not eliminated by processes where the product temperature is increased.

Lets focus on aflatoxin, a mycotoxin resulting from a complex biosynthesis pathway. Between the acetate at the start of the biosynthesis pathway and the synthesis of aflatoxins B1, B2, G1 and G2, we note no fewer than 15 intermediaries for which the toxicity needs to be defined. Progress in the analytical area today enables the detection of new forms of "classical" toxins that cannot be detected by conventional analytical methods (Elisa, HPLC...). To regulate the different forms of mycotoxins, it will be necessary to obtain information on their toxicity and on the exposure levels.

Aflatoxin B1 results observed, all feed materials for animal feed in conventional and organic feed plans over a period of 5 years.					
	Average of the values observed on feed materials in µg/kg *	Average of the values quantified on feed materials in µg/kg	Minimum values quantified in µg/kg	Maximum values quantified in µg/kg	Feed material for which the maximum value is related
201	9 0.2	0.97	0.1	3.5	Corn grain
202	0 0.65	1.68	0.1	15	Rice middlings
202	1 0.8	2.37	0.1	16	Organic sunflower cake
202	2 0.66	2.83	0.1	17.3	Organic sunflower cake
202	3 0.47	1.54	0.2	4.4	Spent corn grain

*Statistical processing: allocation of a quantitative value equal to QL/2 when a result is recorded as detected (>DL) but not quantified (<QL) **The optimum quantification limits are at 0.1 µg/kg.

Over a ten-year period, only two samples exceeded the maximum authorised level of 20 μ g/kg, a rice sample in 2015 and a rice product sample in 2018. As aflatoxin B1 is metabolised into aflatoxin M1 secreted in milk, the levels of aflatoxin B1 are monitored in the feed plans for milk cattle. The maximum values

recorded over five years do not exceed 1.5 μ g/kg, well below the regulatory level of 5 μ g/kg. In 2024, the members of the feed plan steering committee opted to collect data on aflatoxins B2, G1 and G2 in addition to the results on aflatoxin B1.

PREVALENCE OF MYCOTOXINS & INFLUENCE FACTORS

Mycotoxins are secondary metabolites secreted by mould belonging mainly to the Fusarium, Aspergillus and Penicillium types. A fungus may produce different mycotoxins. A mycotoxin may be produced by different fungi. The fungus may disappear, leaving the mycotoxin. The fungus may be present without producing mycotoxins.

The balance between producing fungi is modified by their environmental conditions. The factors that influence the production of mycotoxins such as change in temperature, climate, change in flowering period, harvests... highlight the interest to be able to know the impact of climate change, have forecast tools for crops, pests or mycotoxins. Through its work, Arvalis is contributing to providing insights about these impacts. Moreover, numerous studies are being carried out by different structures in Europe, and the increase in aflatoxins due to global warming has been modelled by Paola Battilani. For several years, alerts indicating contamination of production by aflatoxins in Romania, Italy, Spain, Portugal and Greece have been made. Changes in agricultural practices, management of certain insect pests, grassy weeds, toxicogenic fungi, decline in ploughing, difficulties in the use of irrigation, dates of sowing and harvesting of spring crops, crop rotation, sowing density, genetic progress, sorting of seeds after harvest also have an impact that needs to be taken into consideration. The agriculture academy in France proposes accessible items on these topics.

CLAVICEPS

Fungi

FUSARIUM

ASPERGILLUS





OQUALIM

ASSESSING THE TOXICITY





- DON, ZEA, FUMO and their modified forms (see our 2020 edition)
- Synergy or antagonism of fungi, cocktail effects of mycotoxins?
- Impacts on health



On another time scale, the capacities for preparing samples and analyses are also evolving. **HPLC GC/MS ELISA** Gas Chromatography Enzyme linked Immunosorbent Assays Mass Spectometry

LC-MS/MS Liquid Chromatography tandem Mass Spectrometry

EMERGING FUSARIUM TOXINS: BEAUVERICIN, ENNIATINS, MONILIFORMINS

The emerging fusarium toxins working group (GT FUSE), within the Food Chain Surveillance platform

Margot BÄRENSTRAUCH you co-steer the FUSÉ working group, could you present this working group's context and objectives?

Bénédicte RENAUD you co-steer the FUSÉ working group, could you give us more detail on what led you to become involved in this issue?



Margot, what are the other actions of this working group programme?

Like the cadmium working group, the first work focus will be dedicated to listing the existing monitoring plans. Next, work to document sources and levels of contamination in the feed chain is planned, notably through the exploitation of literature data and data transmitted to Efsa. Some operators have monitored these mycotoxins for several years and have proposed to share their results.

After the work on cadmium monitoring in 2022, the Platform wanted the following working group to be dedicated to an emerging danger. After proposing and prioritising subjects of interest, the Platform's partners highlighted emerging mycotoxins. Moreover, work on the toxicity of enniatins is on-going as part of the European PARC project. They could lead to the proposal of benchmark toxicological values and the amendment to the Efsa's conclusions.

The aims of the working group are above all to propose recommendations that will enable the different monitoring players to optimise the existing plans or to rapidly implement an effective plan if needed.

Mycotoxins have been a concern for a long time in the cereal sector, certain are well known and are subject to dedicated regulations or recommendations such as aflatoxins, DON, zearalenone, fumonisins both for human food and animal feed. Others are less well known such as so-called "emerging" fusarium toxins. Sharing information across several sectors enables collective progress, improvements to knowledge and anticipation of regulations that could be implemented in the coming years.

It appeared to me to be essential to contribute on behalf of Intercéréales, with support from Arvalis, to the work. Even more so as the results will enable us to direct the Monitoring Plan for the cereal sector, if required.

The group will aim to produce recommendations that will cover all stages of monitoring, from the construction of sampling plans up to information sharing, along with management of analytical tools and the quality of the collected data. Summary sheets will be prepared to make the work accessible to a wide audience. The working group is just starting and its actions could evole by the end of the mandate, planned for summer 2025. •

UNDER DEBATE

MINERAL OILS

4 questions to Laura KRIEGER, project manager at ITERG

The "Update on MOAH, MOSH and mixtures" published by the Animal Feed Monitoring platform shows the growing interest for this subject since 2008. In 2023, the EFSA updated the assessment on risks in food. This contaminant has not been assessed in feed.

What are mineral oils?

Laura KRIEGER : Mineral oils are complex mixtures from unrefined oil constituted of mineral oil saturated hydrocarbons (MOSH for Mineral Oil Saturated Hydrocarbons) and mineral oil aromatic hydrocarbons (MOAH for Mineral Oil Aromatic Hydrocarbons). MOSH may be constituted of



alkanes (linear or branched) and naphthenes (saturated chain hydrocarbon rings). MOAH are constituted of 1 to 7 aromatic rings linked with aliphatic chains and naphthenic rings. These compounds have a structure similar to polycyclic aromatic hydrocarbons (PAH) but are much more alkylated (longer chains).

In what way do they enter into feed?

LK: There are multiple sources of contamination by these hydrocarbons which can take place at all stages of the transformation chain, from harvest to packaging. We can find them in certain phytosanitary treatments, via technological auxiliaries, by leaks of lubricants, or from migration from packaging during storage (numerous products such as inks, glues and adhesives may contain mineral-origin hydrocarbons).

While the toxicological data still need to be consolidated, what indicators do we have on what would be acceptable in food and feed?

LK: The EU member states published the SCoPAFF opinion (Standing Committee on Plants, Animals, Food and Feed Section Novel Food and Toxicological Safety of the Food Chain) in April and October 2022 concerning the presence of mineral oil aromatic hydrocarbons in feedstuffs. This opinion recommended thresholds for limits of MOAH according to the quantity of fat, not to be exceeded in feed products, under penalty of withdrawal. To date, no regulation (or proposal) for animal feed is planned. Whether it is for food or feed, the levels of contaminants must be kept

as low as can reasonably be attained by following best practices at all stages (ALARA approach).

On the analytical aspect, what are the current capabilities?

LK: For around ten years now, the essential analytical system for analysing mineral oils is the LC-GC-FID coupling (liquid phase chromatography followed by gas phase chromatography equipped with a flame ionisation detector). This configuration has been constantly improved thanks to the addition of supplementary stages (saponification, epoxidation...) in order to reach the limits of quantification of around the ppm for MOSH and MOAH. The results obtained give total levels of MOSH and MOAH but do not enable the MOAH to be separated according to the number of aromatic rings that they are composed of (EFSA has highlighted a proven toxicity for MOAH containing 3 and more aromatic rings). For the moment, only the "GC 2D" analytical technique provides this information but there are no official methods, and the cost of this equipment is a barrier to its development.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

These artificial chemical substances created for their interesting technical properties, are widely used in industry (notably textiles, household cleaning products, firefighting, automotive industry, food transformation, construction, electronics). The EFSA has concluded that exposure to these products may have adverse effects on human health and that food may be contaminated by these substances.

In that sense, maximum limits for these substances have been set for human food for certain animal-origin feedstuffs (meat, eggs and fish). With regard to animal feed, there are not, do date, any regulatory thresholds but a European Commission recommendation for the monitoring of PFAS in animal feed should be published soon. The matrices that should be targeted in this recommendation are very broad and notably concern fish, derivative products and feed containing it, algae, derivative products and feed containing it, mineral-origin matrices, fodder, grass, hay, silage and water. In order to set the feed and supplement plans in a momentum of collective monitoring, exploratory PFAS analyses were introduced into the 2024 plans. The aim is to obtain a situational analysis of animal feed matrices that could be concerned by these contaminants and know the background levels.



Work to reference laboratories was carried out by OQUALIM to enable participants to obtain reliable analysis results. However, it would appear that laboratories continue to encounter difficulties when analysing PFAS in all matrices concerned by the pooled monitoring.

¹ https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2020.6223