National Reference Laboratory for Feed Additives and Authorisations

End of Year Report
2024 - 2025

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1. Introduction

Assimilated EU Regulation No. 1831/2003 on *additives for use in animal nutrition* describes 'feed additives' as substances, micro-organisms or preparations, other than feed material and premixtures, which are intentionally added to feed or water in order to perform, in particular, one or more of the following functions:

(a) favourably affect the characteristics of feed,

(b) favourably affect the characteristics of animal products,

(c) favourably affect the colour of ornamental fish and birds,

(d) satisfy the nutritional needs of animals,

(e) favourably affect the environmental consequences of animal production,

(f) favourably affect animal production, performance or welfare, particularly by affecting the gastro-intestinal flora or digestibility of feedingstuffs, or

(g) have a coccidiostatic or histomonostatic effect.

Feed additives should not:

(a) have an adverse effect on animal health, human health or the environment,

(b) be presented in a manner which may mislead the user,

(c) harm the consumer by impairing the distinctive features of animal products or mislead the consumer with regard to the distinctive features of animal products.

Antibiotics, other than coccidiostats or histomonostats, are not authorised as feed additives.

Depending on their functions and properties feed additives are allocated to one or more of the categories listed in Article 6 of assimilated Regulation (EC) No 1831/2003. The categories are:

(a) technological additives: any substance added to feed for a technological purpose;

(b) sensory additives: any substance, the addition of which to feed improves or changes the organoleptic properties of the feed, or the visual characteristics of the food derived from animals;

(c) nutritional additives;

(d) zootechnical additives: any additive used to affect favourably the performance of animals in good health or used to affect favourably the environment;
(e) coccidiostats and histomonostats.

LGC currently holds the role of National Reference Laboratory (NRL) for feed additives and authorisations for Great Britain. The tasks and objectives for the feed additive and authorisations NRL are as follows:

Part 1: NRL Core function
Objective 1. Secretariat services
Objective 2. Advice and representation within the UK and internationally
Objective 3. Production of standard operating procedures, codes of practice and guidance documents
Objective 4. Compliance assessment via audits and ring trials
Objective 5. Co-ordination within the UK of international initiatives
Objective 6. Communication of results and data use

Part 2: Feed Additive Regulated Product Authorisation
Objective 1. Infrastructure development
Objective 2. Maintenance of infrastructure
Objective 3. Core authorisation activities

This report provides an update for the National Reference Laboratory role for Feed Additives for the year April 2024 to March 2025.

2. Quality and staff competence

The Office of the Government Chemist at LGC, which hosts the feed additives and authorisations NRL role, has continued to maintain its quality systems to the requirements of ISO17025 and BS9001. Annual assessments carried out by UKAS, together with internal audits, help ensure that quality and accreditation is maintained. The annual UKAS assessment was carried out in February 2025. Three minor non-conformances and one recommendation were raised against the Office of the Government Chemist team and the

findings are being actioned. This visit was brought forward compared to previous years to enable an assessment to be carried out prior to the laboratory's move to Guildford. Following the move, the revalidation / verification of methods and quality management processes will be reviewed by UKAS.

Feed additives cover a very wide range of chemicals / materials / substances and therefore experience and competency is needed in a wide range of techniques. To maintain and evidence ongoing competency of staff, proficiency tests (PTs) are regularly participated in. It is generally acknowledged that the number of PTs directly relevant to the analysis of feed and feed additives is limited. As the techniques used to analyse feed and feed additives are predominantly the same as those used for the analysis of food, participation in food PTs is also carried out.

It should be noted that while the costs of directly relevant feed rounds are attributed to the NRL role, the majority are funded either directly by LGC or through the Government Chemist programme. This enables the widest range of analytes / matrices to be covered in the most cost-effective way to each programme.

Table 1 gives examples of PT Z-scores obtained in the last year for a range of analytes and matrices. The techniques used for each analysis are also shown in Table 1 as evidence of continuing competency in a wide range of food and feed analysis areas.

Table 1: Examples of PT rounds participated in during 2024

Matrix	Analyte	Z-score	Technique
Fish paste	Moisture	-0.5	Gravimetric
Fish paste	Ash	-0.1	Gravimetric
Fish paste	Fat	0.1	Acid digestion, solvent extraction
Fish paste	Nitrogen	-0.1	Combustion, Thermal Conductivity Detection
Fish paste	Sodium	0.4	Microwave digestion, ICP-OES
Fish paste	Chloride	-1.3	Acid digestion, chloride analyser
Melon seeds	Aflatoxin B1	0.8	Solvent extraction, immunoaffinity column clean-up, HPLC-FL
Melon seeds	Aflatoxin B2	0.9	Solvent extraction, immunoaffinity column clean-up, HPLC-FL
Melon seeds	Aflatoxin G1	0.1	Solvent extraction, immunoaffinity column clean-up, HPLC-FL

Melon seeds	Aflatoxin G2	0.1	Solvent extraction, immunoaffinity column clean-up, HPLC-FL
Melon seeds	Total Aflatoxins	0.6	Solvent extraction, immunoaffinity column clean-up, HPLC-FL
Milk powder	Calcium	1.1	Microwave digestion, ICP-OES
Milk powder	Magnesium	1.6	Microwave digestion, ICP-OES
Milk powder	Phosphorus	0.1	Microwave digestion, ICP-OES
Milk powder	Potassium	0.3	Microwave digestion, ICP-OES
Milk powder	Sodium	0.2	Microwave digestion, ICP-OES
Milk powder	Zinc	0.7	Microwave digestion, ICP-OES
Pig ration	Moisture	-0.4	Gravimetric
Pig ration	Ash	0.4	Gravimetric
Pig ration	Oil	-0.4	Acid digestion, solvent extraction
Pig ration	Protein	0	Combustion, Thermal Conductivity Detection
Pig ration	Vitamin E	-0.5	Saponification, liquid-liquid extraction, HPLC-UV
Pig ration	Zinc	0.4	Microwave digestion, ICP-OES
Dried apricot	Sulphur dioxide	0.2	Distillation, titration
3% aqueous acetic acid	Formaldehyde	0.3	Colorimetry
Poultry feed	Coccidiostats - Narasin	0.3	Extraction, LC-MSMS
Poultry feed	Coccidiostats - Monensin	Not detected - Not present in sample	Extraction, LC-MSMS
Poultry feed	Coccidiostats - Diclazuril	Not detected - Not present in sample	Extraction, LC-MSMS
Poultry feed	Coccidiostats – DNC (from Nicarbazin)	Not detected - Not present in sample	Extraction, LC-MSMS
Poultry feed	Chloramphenicol	0.4	Extraction, LC-MSMS

The instructions for the poultry feed PT round were to ‘Identify and determine the level of analyte(s) present in the test material’ and then listed 14 coccidiostats in addition to chloramphenicol. As it was not financially feasible to purchase standards for all 14 coccidiostats, four were chosen for analysis. Of the four analysed, only narasin was present in the sample. The report issued by Fapas following the conclusion of the PT stated that the sample had been spiked with chloramphenicol, amprolium, narasin and salinomycin. The report also stated that ‘for amprolium, it

was not possible to set an assigned value because of the low number of results and lack of consensus amongst them'.

As examples of the z-scores obtained by LGC compared to those obtained by the other participants, Figure 1 is a copy of the graph from Fapas Food Chem. Report 02571 showing the z-scores for all participants for the coccidiostat narasin in a sample of poultry feed and Figure 2 is a copy of the chart from the same Fapas report showing the z-scores for chloramphenicol; LGC is lab number 21 in both.

Figure 1: Narasin in poultry feed – Z-scores for all participants (Chart taken directly from Fapas (Fera Science Ltd) report Food Chem. Report 02571)

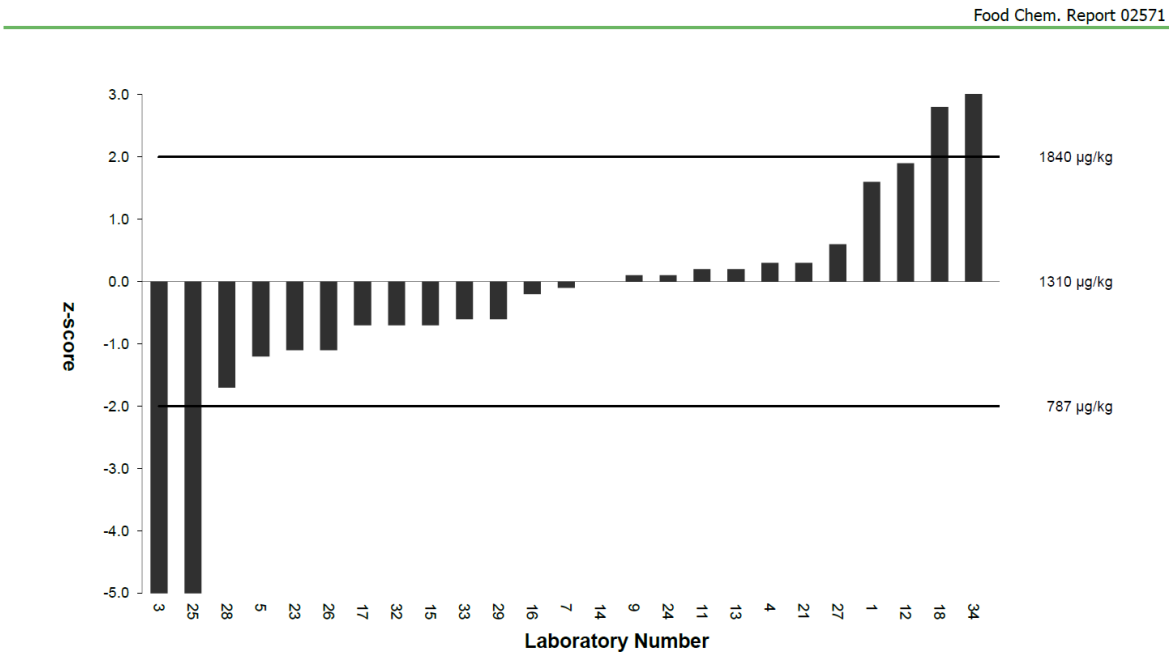
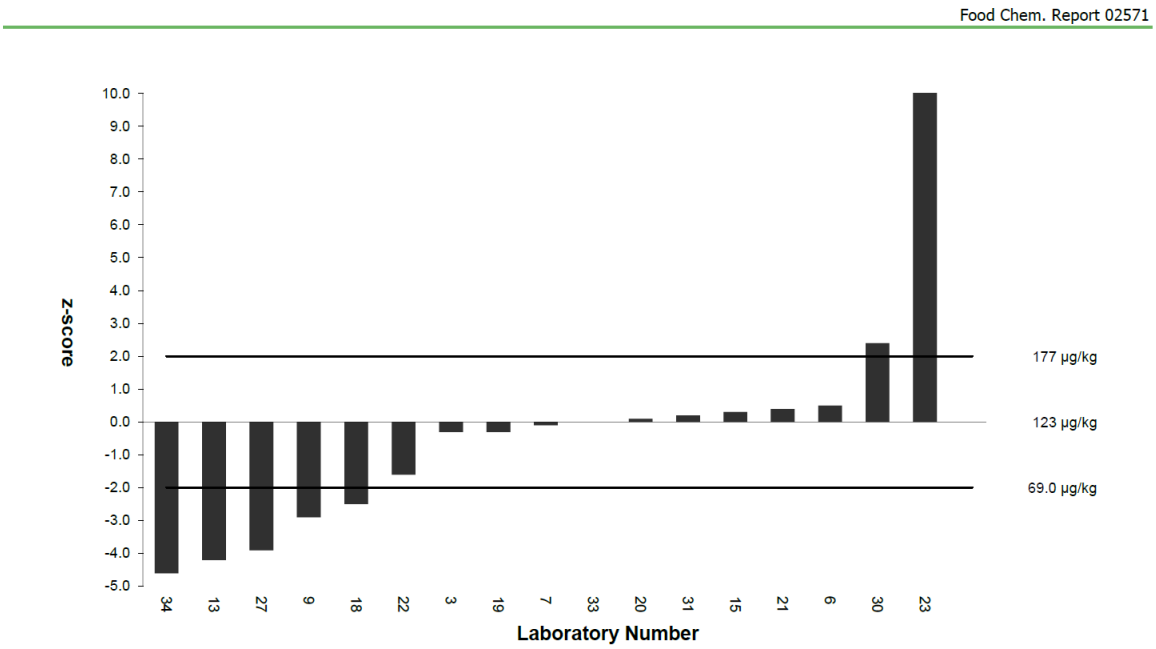
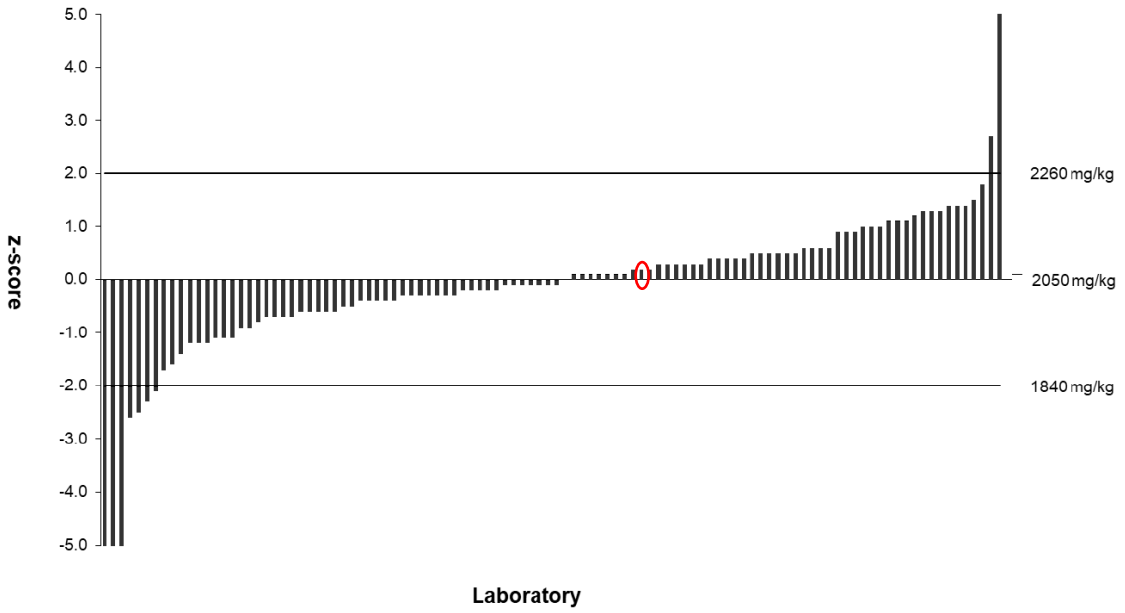


Figure 2: Chloramphenicol in poultry feed – Z-scores for all participants (Chart taken directly from Fapas (Fera Science Ltd) report Food Chem. Report 02571)



A very good z-score of 0.2 was also obtained for the determination of sulphur dioxide in a sample of dried fruit. Whilst this analysis is not directly linked to feed additives it demonstrates competency in the wet chemistry techniques of distillation and titration, techniques that could be used to analyse additives. Figure 3 is a copy of the graph from Fapas Food Chem. Report 20227 showing the z-scores for all participants for sulphur dioxide in a sample of dried apricot; due to the number of participants, the lab numbers are not listed therefore LGC's results is circled.

Figure 3: Sulphur dioxide in dried apricot – Z-scores for all participants (Chart taken directly from Fapas (Fera Science Ltd) report Food Chem. Report 20227)



3. Proficiency test review

A review of feed related PTs being organised in 2025 was carried out. A summary of the findings is presented in Annex 1.

4. Horizon scanning

The Rapid Alert System for Food and Feed (RASFF) is reviewed monthly to try and detect trends and help identify possible future issues. However, it should be noted that the notifications in RASFF are those made by EU member states and may not reflect the situation in the UK. The product categories reviewed are feed additives, feed materials, feed premixtures, compound feed and pet food, together with the risk category of feed additives.

In the 11 months from April 2024 to February 2025 there were 273 RASFF notifications for the above categories. Together, salmonella and Enterobacteriaceae accounted for 111 (41 %) of the notifications. The next highest category was mould with 25 (14 %) notifications. These figures compare with 118 (39 %) and 42 (9 %)

respectively for the year April 2023 to March 2024. Table 2 summarises all 273 notifications from April 2024 – February 2025.

Table 2: Feed RASFF notifications April 2024 to February 2025

Reason for notification	Number of notifications (April 2024 - February 2025)
Salmonella / Enterobacteriaceae	111
Mould	25
Pesticides / Herbicides	23
Ragweed (Ambrosia spp.)	16
Metal particles / Metal / Plastic / Glass / Porcelain fragments / Sharp pieces / Foreign bodies	13
Missing / Incorrect documents / No veterinary checks / Missed official controls	12
Mycotoxins (Aflatoxins, T2/HT2, Deoxynivalenol, Fumonisins)	10
Zinc / Copper / Manganese / Lead / Selenium / Cadmium / Mercury	10
Dioxins	9
Ruminant DNA / protein / Porcine DNA / Poultry DNA	9
Health risk	5
CBD	4
Coccidiostats (Diclazuril / Lasalocid / Salinomycin / Narasin / Robenidine)	4
Datura seeds	4
Processed animal protein / Products of animal origin / Fish particles / Terrestrial vertebrate particles	3
GMO	2
Unauthorised additive	2
Antibiotic residues	1
Anthraquinone	1
Dioxins and pesticides	1
Hydrocyanic acid	1
Incorrect labelling	1
Matrine, Amitraz and Pyrrolizidine Alkaloids	1
Microcystins	1
Oxymatrine	1
PCBs	1
Rye ergot / Ergot (Claviceps purpurea)	1
Semicarbazide	1
Total	273

During the 11 months reviewed there were 2 RASFF notifications relating to the presence of unauthorised feed additives, a decrease from 7 in the preceding 12 months. The unauthorised additive notifications were:

- Unauthorised substance ethoxyquin in fish meal from Mexico
- Unauthorised additives in feed supplements from France (additives not specified).

No significant trends were identified from the RASFF notifications.

Table 3 shows a comparison of the RASFF notifications for the feed categories listed above reported in 2024 compared to those reported in 2022 and 2023.

Table 3: Comparison of feed related RASFF notifications in 2022 to 2024

Reason for notification	2022	2023	2024
Salmonella / Enterobacteriaceae / Bacteria / Microbiological	116	121	126
Unauthorised additive	15	6	4
Arsenic / Cadmium / Copper / Lead / Manganese / Mercury / Nickel / Selenium / Zinc	14	22	12
Mycotoxins (Aflatoxins, T2/HT2, Deoxynivalenol, Fumonisins)	11	24	10
Pesticides / Dioxins and pesticides / Herbicides	11	18	29
Foreign bodies / Metal particles / Metal / Plastic / Glass / Porcelain fragments	9	8	15
Ragweed (Ambrosia spp.)	8	11	23
Ruminant DNA / protein / Porcine DNA / Poultry DNA	8	7	11
Ethylene oxide	6	1	
Mould	5	42	24
Dioxins	4	12	12
Rye ergot / Ergot (Claviceps purpurea)	3	4	1
Cyanide	3	2	
Coccidiostats (Diclazuril / Lasalocid / Salinomycin / Narasin / Robenidine)	2	3	4
Missing / incorrect documents / No veterinary checks / missed official controls / Incorrect labelling / Unauthorised operator	2	2	12
GMO	2	2	2

Not stated	2	2	
Veterinary drug	2		1
Fluorine	2		
Processed animal protein / Products of animal origin / Fish particles / Terrestrial vertebrate particles	1	1	3
Vitamin D3	1	1	
Antibiotic residues	1		1
Matrine, Amitraz and Pyrrolizidine Alkaloids	1		1
Dodder seeds (*Cuscuta spp*.)	1		
Nitrite	1		
Datura seeds		2	5
Health risk / Consumer complaint		2	5
Insects / insect larvae / pests		2	
Colours (Ponceau 4R)		1	
Fraud		1	
Glukoalkaloids		1	
Glycerol triheptanoate (GTH)		1	
Tuberculosis		1	
Urea		1	
CBD			2
PCBs			1
Technical grade chemicals			1
Hydrocyanic acid			1
Microcystins			1
Total	231	301	307

The total number of feed related RASFF notifications in 2024 (307) was similar to the number recorded in 2023 (301). Over the 3 years there has been an increase in the number of notifications relating to pesticides / herbicides (11 2022, 18 2023, 29 2024) and an increase in notifications relating to ragweed (Ambrosia spp.) (8 2022, 11 2023, 23 2024). Over the same time period there has been a decrease in RASFF notifications attributed to unauthorised feed additives (15 2022, 6 2023, 4 2024). A summary of unauthorised feed additives RASFF notifications is given in Table 4.

Table 4: Unauthorised feed additives RASFF notifications for 2022 – 2024

Unauthorised feed additives	2022	2023	2024
CBD	5	1	
Not stated	1	3	1
Ethoxyquin	1	1	1
Astaxanthin	1		
Boric acid	1		
CBD and L-theanine	1		
Cobalt carbonate, cobalt carbonate hydroxide monohydrate	1		
E100 (curcumin), E150a (caramel)	1		
Inositol	1		
Sodium acetate	1		
Vitamin D2	1		
Formaldehyde		1	
Lanthanum carbonate			1
Vitamin K1			1
Total	15	6	4

5. Standardisation activities

There has been no relevant activity by CEN TC 327 WG3 'Feed additives and drugs" in the last year.

6. Meetings

Quarterly review meetings were held in conjunction with the GMO NRL in April, August and October 2024 and January 2025. Copies of the presentations given at these meetings, together with the action log were uploaded to the FSA Teams Channel.

A pre-recorded presentation summarising the feed additive authorisation process was provided for the FSA's Food and Feed Laboratory Workshop 2024 held on 16th April 2024. Various LGC staff attended the workshop, and Kirstin Gray was part of a panel organised to answer questions on their relevant NRL areas.

Searches were regularly carried out for any applicable upcoming national or international conferences or meetings. Nothing relevant to the NRL role was found.

A meeting was held with the FSA Feed Delivery team on 12th November to discuss feed national enforcement and sampling priorities.

7. Official Laboratory Advice, training and support

Issues with the method for the determination of vitamin A in feed were raised previously and investigated with regards to reported issues with poor recoveries and variation in replicate results. The method for the determination of vitamin A is described in Annex IV, Methods of analysis to control the level of authorised additives in feed, of assimilated EU Regulation 152/2009. The scope of the method is stated as 'This method makes it possible to determine the level of vitamin A (retinol) in feed and premixtures. Vitamin A includes all-trans-retinyl alcohol and its cis-isomers, which are determined by this method. The content of vitamin A is expressed in International Units (IU) per kg. The limit of quantification is 2 000 IU vitamin A / kg'. The principle is as follows: the sample is hydrolysed with ethanolic potassium hydroxide solution and the vitamin A is extracted into light petroleum. The solvent is removed by evaporation and the residue is dissolved in methanol. The content of vitamin A is determined by reversed phase high performance liquid chromatography (RP-HPLC) using a UV or a fluorescence detector.
A summary of the investigations into the determination of vitamin A is given in Annex 2.

8. Official Laboratory capability

A report summarising the results from the OL survey was published. The survey, organised and carried out under the Government Chemist programme, included questions regarding training, support or method development that NRLs could provide.

To help provide an assessment of overall OL capability, a review of the OLs accreditation status was carried out. The accreditation scope for each laboratory is published on the UKAS website and each scope was looked at for methods and analyses accredited for in feed matrices; a summary is provided in Annex 3. Moisture, nitrogen / protein, oil,

vitamins A and E and a range of elements appear to be the standard analyses accredited by the majority of OLs in animal feeding stuffs. A number of the OLs (Kent Scientific Services, Lancashire County Scientific Services, Aberdeen Scientific Services, Tayside Scientific Services and Minton, Treharne and Davies Limited) also hold generic / flexible scopes for the development of methods of analysis for analytes including additives, colourings, preservatives and contaminants in animal feeding stuffs using a variety of techniques such as HPLC, AAS, ICP-OES, ELISA, UV/Visible spectrophotometry, microscopy and classical wet chemistry techniques.

9. Reporting

Monthly activity logs and quarterly reports have been completed and the annual report describing activities carried out in the last year submitted and a copy placed on the NRL webpage.

10. Legislation updates

Under the Government Chemist programme regular reviews of legislation relating to feed and food are carried out. A summary of GB and EU feed additives authorisations and renewals published - during the year between April - December 2024 is provided in Annex 4 (GB) and Annex 5 (EU).

11. NRL website

The LGC Group website has recently undergone a refresh. The refreshed site is designed to enhance user experience, showcase LGC's impactful work, and make it easy for visitors to access information and connect with business areas faster. The look and feel of the NRL pages has been updated, but the content is unchanged. The NRL and authorisations webpages can be found at National Reference Laboratories - LGC Group and Authorisation of Feed Additives for Great Britain (GB) - LGC

12. Feed Additive Authorisation

Feed additives are regulated products and as such require authorisation before use.

Under part 2 of the NRL contract, feed additive regulated product authorisation, the NRL is responsible for:

- the reception, preparation, storage and maintenance of reference samples and reference standards where applicable.
- evaluating the data provided by the applicant for authorisation to place the feed additive on the market, for the purpose of testing and evaluation or validation of the method for detection.
- submitting a full evaluation report to the FSA Risk team for each application within 3 months from the date of receipt of a valid application and payment of fee. This period can be extended for complex applications or where supplementary information is requested.

As the NRL would be responsible for storage of any feed additive reference samples and standards received, suitable storage facilities with accurate temperature monitoring are required. Throughout the year suitable storage facilities (fridges, freezers and ambient areas) have been monitored and maintained.

Following meetings with the FSA on 17th and 25th April, LGC's Feed Additive authorisations webpage (https://www.lgcgroup.com/what-we-do/quality-assurance/national-laboratories-and-science/national-reference-laboratories/authorisation-of-fas/) was launched on 29th May to coincide with the update of the 'FSA Feed Additives Authorisation Guidance webpage' on 30th May. The LGC page contains guidance documents for applicants which were agreed with the FSA prior to publication.

The inbox for the e-mail address set up for communication with feed additive authorisation applicants and given as the means of contact on the above webpages (feed.additives@lgcgroup.com) is monitored regularly.

Annex 1: Feed Proficiency Tests

A search of the European PT Information System (EPTIS) database was carried out to see which proficiency tests (PTs) are available in areas relevant to the National Reference Laboratory for Feed Additives role. The EPTIS database (www.eptis.bam.de) is a joint publication of a worldwide consortium of organisations with all members being involved in PT and playing a prominent role in national or international quality infrastructures. The overall coordinator of EPTIS is the Federal Institute for Materials Research and Testing (BAM) in Germany and, currently, the EPTIS database lists around 5,000 PT schemes from around 40 countries worldwide.

A search of the EPTIS database was carried out using ‘Accredited’ and the search term ‘feed’. Of the 45 results that were returned, the majority that had been updated in the last year (16) were for mycotoxins, pesticides and microbiology, and were therefore not applicable for feed additives.

A search for ‘additives’ was not particularly useful as it also came back with hits for ‘addition’ and ‘additional’ and the vast majority of the 294 hits were not relevant to feed additives or feed. Details of the only relevant result are given below:

168681	Czechia	Central Institute for Supervising and Testing in Agriculture (UKZUZ),National Reference Laboratory, Department of Proficiency Testing Programmes	MPZ UKZUZ - Additives in Feedstuffs *[MPZ ÚKZÚZ Doplňkové látky v krmivech-vitamíny, kokcidiostatika]*	2025-01-21
	PT name	(MPZ UKZUZ - Additives in Feedstuffs)		

Keywords	
Product groups	Agriculture
Testing fields	Analytical chemistry Veterinary analysis

Technical details

TEST ITEM	TESTED PROPERTY	TESTING METHOD
Feedstuff	Salinomycin	-
	Monensin	-
	Narasin	-
	Nicarbazin	-
	Lasalocid	-
	Robenidin	-
	Vitamin A	-
	Vitamin E	-
	Vitamin D3	-

Aims of the PT scheme	
Target group of participants	analytical laboratories, agricultural laboratories, veterinary laboratories
Linked to specific legislation / standards	ISO/IEC 17043:2010
Additional, subsidiary aims	validation of testing methods
Number of participants	20-30
Accredited or otherwise reviewed by a 3rd party	Accredited by Czech Accreditation Institute on the basis of ISO/IEC 17043:2010
Operation is commissioned / requested by	Ministry of Agriculture
Fees and frequency	
Participation fee	2800 CZK - coccidiostats, 1400 CZK - vitamins
Regularly operated	Yes (Once a year PT coccidiostats (May/June) / Once a year PT vitamins (October/November))
Year of first operation	2003

Contact details of the PT provider

Provider	Contact person
Central Institute for Supervising and Testing in Agriculture (UKZUZ),National Reference Laboratory, Department of Proficiency Testing Programmes Hroznova 63/2, Pisarky 603 00 Brno Czechia Phone: +42(0) 543 548 111, +42(0) 543 548 220 Fax: +42(0) 543 210 444 Web: http://www.ukzuz.cz	Mr. Martin Vana Phone: +42(0) 543 548 220 Fax: Email: martin.vana@ukzuz.gov.cz

A search of the EPTIS database using the search term ‘feed’, ‘Accredited’ and ‘United Kingdom’ came back with 5 hits, 1 for LGC AXIO Proficiency testing, 1 for Animal and Plant Health Agency (APHA) and 3 for Fera Science Limited. The scheme run by APHA was for salmonella in animal feed and two of Fera Science Limited schemes were for GM and microbiology. Details of the feed schemes provided by LGC AXIO Proficiency Testing and Fera Science Limited are detailed below.

Fera Science Ltd (Fapas)

Product Code	Item Code	Start Date	Matrix	Analytes		
Proficiency Test						
Veterinary Medicines in Animal Feed Proficiency Test						
FCVD40-AFE1	02592	19/03/2025	Animal Feed	antibiotics	£315.00	+
Veterinary Medicines in Animal Feed Blank Material						
BLPM1-AFE4	02592b	19/03/2025	Blank Animal Feed	BLANK (BLPM1)	£98.00	+
Coccidiostats & Chloramphenicol in Poultry Feed Proficiency Test						
FCVD8-AFE15	02618	25/09/2025	Poultry Feed	coccidiostats & chloramphenicol (contaminant levels)	£326.00	+
Veterinary Medicines in Animal Feed Proficiency Test						
FCVD17-AFE1	02626	10/11/2025	Animal Feed	Beta-agonists	£326.00	+
Veterinary Medicines in Animal Feed Blank						
BLVD17-AFE4	02626b	10/11/2025	Blank Animal Feed	BLANK for beta-agonists (BLVD17)	£101.00	+
Veterinary Medicines in Animal Feed Proficiency Test						
FCVD40-AFE1	02640	18/03/2026	Animal Feed	antibiotics	£326.00	+
Veterinary Medicines in Animal Feed Blank Material						
BLPM1-AFE4	02640b	18/03/2026	Blank Animal Feed	BLANK (BLPM1)	£101.00	+

Aflatoxins in Animal Feed (Cereal Based) Proficiency Test

FCMM4-AFE2	04548	03/04/2025	Animal Feed (Cereal Based)	aflatoxins B & G &/or total & OTA	£331.00	+

Mycotoxins in Pet Dog Food Proficiency Test

FCMM18-PFO11	04559	10/07/2025	Pet Dog Food (Dry, Cereal Based)	aflatoxin B1, DON, ZON, OTA, FB1 & FB2 & total fumonisins (as a sum of FB1 & FB2), T-2 & HT-2 toxins & as sum of T-2 & HT-2 toxins & 4,15-Diacetoxyscirpenol (DAS)	£601.00	+

Aflatoxins in Animal Feed (Cereal Based) Proficiency Test

FCMM4-AFE2	04569	29/09/2025	Animal Feed (Cereal Based)	aflatoxins B & G &/or total & OTA	£331.00	+

Mycotoxins in Animal Feed (Cereal Based) Proficiency Test

FCMM5-AFE2	04576	19/11/2025	Animal Feed (Cereal Based)	contamination of matrix with two or more from the following list: aflatoxin B1, OTA, ZON, DON, FB1 & FB2 & total fumonisins (as a sum of FB1 & FB2)	£430.00	+

Heavy Metals in Animal Feed (Plant Origin) Proficiency Test

FCCM45-AFE23	07568	10/03/2025	Animal Feed (Plant Origin)	selection of metals at high levels	£244.00	+

Heavy Metals in Pet Dog Food (Dried) Proficiency Test

FCCM46-PFO7	07580	19/05/2025	Pet Dog Food (Dry)	selection of metals at natural/low levels	£260.00	+

Heavy Metals in Animal Feed (Cereal Based) Proficiency Test

FCCM46-AFE2	07606	21/11/2025	Animal Feed (Cereal Based)	selection of metals at natural/low levels	£260.00	+

Heavy Metals in Animal Feed (Plant Origin) Proficiency Test

FCCM45-AFE23	07619	09/03/2026	Animal Feed (Plant Origin)	selection of metals at high levels	£260.00	+

Pesticide Residues (multi-residues) in Animal Feed (Cereal Based) Proficiency Test

FCPM2-AFE2	09191	09/10/2025	Animal Feed (Cereal Based)	pesticide residues (multi-residue)	£252.00	+

Pesticide Residues (multi-residues) in Animal Feed (Cereal Based) Blank Proficiency Test

BLPM2-AFE21	09191b	09/10/2025	Blank Animal Feed (Cereal Based)	BLANK for pesticide residues (multi-residue) (BLPM2)	£80.00	+

Nutritional Components in Dairy Ration Proficiency Test

FCNC1-AFE7	10199	03/03/2025	Dairy Ration	selection of nutritional components	£433.00	+

Nutritional Components in Pig Ration Proficiency Test

FCNC1-AFE14	10200	10/07/2025	Pig Ration	selection of nutritional components	£302.00	+

Nutritional Components in Soybean Meal Proficiency Test

FCNC1-AFE20	10201	26/09/2025	Soybean meal	selection of nutritional components	£269.00	+

Nutritional Components in Pet Dog Food (Dry) Proficiency Test

FCNC1-PFO7	10202	07/11/2025	Pet Dog Food (Dry)	selection of nutritional components	£302.00	+

Nutritional Components in Poultry Ration Proficiency Test

FCNC1-AFE16	10203	04/12/2025	Poultry Ration	selection of nutritional components	£448.00	+

Nutritional Components in Premix Proficiency Test

FCNE1-AFE17	10204	14/01/2026	Premix	selection of nutritional elements	£269.00	+

Nutritional Components in Dairy Ration Proficiency Test

FCNC1-AFE7	10205	02/03/2026	Dairy Ration	selection of nutritional components	£448.00	+

Mycotoxins in Animal Feed (Cereal Based) Proficiency Test

FCMF2-AFE2	22248	24/09/2025	Animal Feed (Cereal Based)	deoxynivalenol (DON), zearalenone (ZON), T-2 & HT-2 toxins & as a sum of T-2 & HT-2 toxins	£365.00	+

Mycotoxins in Animal Feed Proficiency Test

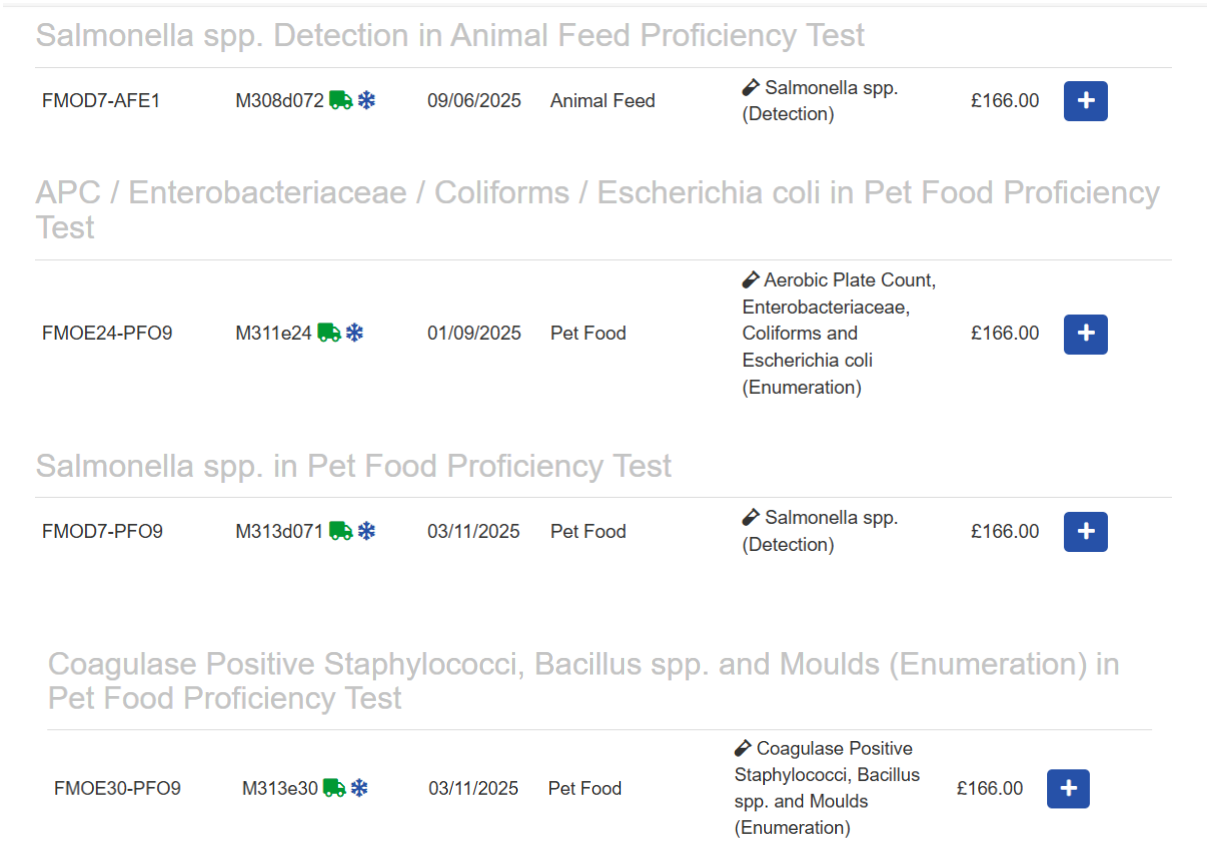
FCMF11-AFE1	22253	14/01/2026	Animal Feed	Deoxynivalenol (DON),Deoxynivalenol 3-glucoside (DON-3-Glc) & 3-Acetyldeoxynivalenol (3-Ac-DON)	£324.00	+

Contaminants in Animal Feed (Cereal Based) Proficiency Test

FCCP5-AFE2	30168	27/06/2025	Animal Feed (Cereal Based)	melamine & cyanuric acid	£253.00	+

GM Events in Animal Feed Proficiency Test

FGM3-AFE1	GeMMP46	14/03/2025	Animal Feed	Maize & Soya	£391.00	+
FGM3-AFE1	GeMMP48	13/03/2026	Animal Feed	Maize & Soya	£405.00	+



Analytes included in the various rounds include:

<u>Nutritional analysis</u>

Moisture	Ash	Total oil
Protein	Fibre	Vitamin E

<u>Minerals and trace elements</u>

Calcium	Magnesium	Manganese
Phosphorus	Sodium	Zinc
Selenium	Iron	

LGC AXIO Proficiency Testing

CHEMISTRY

Sample PT-AF-01 **Nutritional analysis in animal feed**
Supplied as: 125g sample of animal feed

Analyte	Method	AV	Range	SDPA	Units	DP
Moisture	Oven drying, Vacuum oven	RMean	All	0.5	%	2
Crude protein	Dumas, Kjeldahl	RMean	All	5% of AV	%	2
Crude fat	Direct extraction	RMean	All	10% of AV	%	2
	Acid hydrolysis	RMean	All	10% of AV	%	2
Crude ash	AOAC 942-05, EC 152/2009	RMean	All	5% of AV	%	2
Ash insoluble in hydrochloric acid	EC 152/2009	RMean	All	20% of AV	%	3
Sugars	EC 152/2009	RMean	All	20% of AV	%	3
Crude fibre	EC 152/2009, Fibre analyser (e.g. Fiibretec), Gafta method10:0, ISO 6865	RMean	All	10% of AV	%	3
Starch	Enzymetric, Polarimetric	RMean	All	10% of AV	%	2
ADF	ISO 13906, AOAC973.18	RMean	All	10% of AV	%	2
NDF	ISO 16472, AOAC 2002.04	RMean	All	10% of AV	%	2
PPD (Pepsin protein digestibility)	AOAC 971.09, ISO 6655	RMean	All	10% of AV	% of total protein	2
pH	pH meter	RMean	All	0.10	-	2
Calorific value	Bomb calorimeter, Calorimeter	RMean	All	Robust SD	kilocalories per kg	0

Sample PT-AF-02 **Minerals and elements in animal feed**
Supplied as: 125g sample of animal feed

Analyte	Method	AV	Range	SDPA	Units	DP
Arsenic	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	3
Cadmium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	3
Calcium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Chloride	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	5%	g/kg	2
Chromium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Cobalt	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	3
Copper	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	2
Iron	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1

Analyte	Method	AV	Range	SDPA	Units	DP
Lead	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	3
Magnesium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Manganese	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1
Mercury	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	3
Phosphorus	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Potassium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Selenium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	3
Sodium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Zinc	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1

Sample PT-AF-05* **Mycotoxins in animal feed**
Supplied as: 125g sample of animal feed

Analyte	Method	AV	Range	SDPA	Units	DP
Aflatoxin B_1	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2
Aflatoxin B_2	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2
Aflatoxin G_1	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2
Aflatoxin G_2	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2
Total Aflatoxins	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2
Ochratoxin A	HPLC, LC-MS, LC-MS/MS, ELISA	RMean	All	Robust SD	µg/kg	2

*Please note that these samples are not currently within the scope of LGC's UKAS accreditation.

Sample PT-AF-08* **Minerals and trace elements in premix materials**
Supplied as: 125g sample of premix

Analyte	Method	AV	Range	SDPA	Units	DP
Arsenic	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Cadmium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	2
Calcium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Chloride	AAS, Colorimetry, ICP-	RMean	All	5%	g/kg	2

Analyte	Method	AV	Range	SDPA	Units	DP
	OES, ICP-MS					
Chromium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Cobalt	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Copper	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	2
Iron	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1
Lead	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Magnesium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Manganese	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1
Mercury	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Phosphorus	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Potassium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Selenium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	20%	mg/kg	2
Sodium	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	g/kg	2
Zinc	AAS, Colorimetry, ICP-OES, ICP-MS	RMean	All	10%	mg/kg	1

*Please note that these samples are not currently within the scope of LGC's UKAS accreditation.

Sample PT-AF-09* **Nutritional analysis of wet pet food**
Supplied as: 125g sample of wet pet food

Analyte	Method	AV	Range	SDPA	Units	DP
Moisture	Oven drying, Vacuum oven	RMean	All	5	%	2
Crude protein	Dumas, Kjeldahl	RMean	All	5%	%	2
Crude fat	Direct extraction, Acid hydrolysis	RMean	All	10%	%	2
Crude ash	Various	RMean	All	5%	%	2
Ash insoluble in hydrochloric acid	Various	RMean	All	20%	%	2
Sugars	Various	RMean	All	20%	%	2
Crude fibre	Various	RMean	All	10%	%	3
Starch	Enzymatic, Polarimetric	RMean	All	10%	%	2
pH	pH meter	RMean	All	0.10	-	2

*Please note that these samples are not currently within the scope of LGC's UKAS accreditation.

Sample PT-AF-13* **Nutritional analysis of fish feed samples**
Supplied as: 125g sample of fish feed

Analyte	Method	AV	Range	SDPA	Units	DP
Energy	Calculation	RMean	All	Robust SD	kJ/100g or kcal/100g	2
Moisture	Oven drying, Vacuum oven	RMean	All	Robust SD	%	2
Crude protein	Dumas, Kjeldahl	RMean	All	Robust SD	%	2
Crude fat	Direct extraction, Acid hydrolysis and extraction	RMean	All	Robust SD	%	2
Crude ash	Drying at 500°C Drying at 525°C Drying at 550°C	RMean	All	Robust SD	%	2
Crude fibre	Various	RMean	All	Robust SD	%	3
pH	pH meter	RMean	All	0.10	-	2

*Please note that these samples are not currently within the scope of LGC's UKAS accreditation.

Sample PT-AF-18* **Anti-oxidants in copra oil**
Supplied as: 50g of copra oil

Analyte	Method	AV	Range	SDPA	Units	DP
Peroxide value	Titration	RMean	All	Robust SD	mEq O2 /kg sample	2
Butylated hydroxyanisole (BHA)	GC-MS	RMean	All	Robust SD	µg/g	2
Butylated hydroxytoluene (BHT)	GC-MS	RMean	All	Robust SD	µg/g	2

*Please note that these samples are not currently within the scope of LGC's UKAS accreditation.

MICROBIOLOGY

Sample PT-AF-06 (A&B) **Salmonella presence/absence**
Supplied as: 06AF- 2 x 10ml vial plus minimum 50g of simulated animal feed matrix
06KB- 2 x 10ml vial plus minimum 50g dried petfood/kibble matrix

Analyte	Method	AV	Range cfu/g	SDPA	Reporting units	DP
Detection of *Salmonella* species	ALL	Qual Form	0 to 1,000	N/A	Detected/Not Detected 25g	N/A

Sample PT-AF-07 **Microbiological quality indicators and probiotics**
Supplied as: 07AF -10g sample of simulated animal feed
07KB -10g dried petfood/kibble + 10ml vial

Analyte	Method	AV	Range cfu/g	SDPA	Reporting units	DP
Total viable count	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of Enterobacteriaceae	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of coliforms	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of *Escherichia coli*	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of lactic acid bacteria	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0

Sample PT-AF-10 **Clostridium perfringens/species**
Supplied as: 1 x 10g sample of simulated animal feed

Analyte	Method	AV	Range cfu/g	SDPA	Reporting units	DP
Total anaerobic count	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of sulphite-reducing Clostridia	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of *Clostridium perfringens*	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of *Clostridium* species	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0

Sample PT-AF-11 **Listeria monocytogenes/species**
Supplied as: 1 x 25g sample of simulated animal feed

Analyte	Method	AV	Range cfu/g	SDPA	Reporting units	DP
Detection of *Listeria* species	ALL	Qual Form	0 to 1000	NA	Detected/Not Detected 25g	NA
Detection of *L.monocytogenes*	ALL	Qual Form	0 to 1000	NA	Detected/Not Detected 25g	NA

Sample PT-AF-15 **Microbiological Contaminants**
Supplied as: 1 x 10g sample of simulated animal feed

Analyte	Method	AV	Range cfu/g	SDPA	Reporting units	DP
Enumeration of coagulase positive Staphylococci	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of *Bacillus cereus*	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0
Enumeration of yeast; mould; yeast and mould	ALL	RMean	0 to 100,000	$\log_{10}$ 0.35	cfu/g	0

Analytes included in the various rounds include:

Nutritional analysis

Acid detergent fibre	Acid insoluble ash	Crude ash
Crude fat	Crude fibre	Crude protein
Moisture	Neutral detergent fibre	Pepsin protein
Starch	Sugars	pH

Minerals and trace elements

Arsenic	Cadmium	Calcium
Chloride	Chromium	Cobalt
Copper	Iron	Lead
Magnesium	Manganese	Mercury
Phosphorus	Potassium	Selenium
Sodium	Zinc	

As can be seen from the above lists, there are a number of feed PTs offered by both Fera Science Ltd (Fapas) and LGC AXIO Proficiency Testing, however there are only a very limited number that are relevant to feed additives. PTs with analytes relevant to feed additives in a feed matrix include:

- Calcium (Fapas and LGC AXIO PT)
- Manganese (Fapas and LGC AXIO PT)
- Selenium (Fapas and LGC AXIO PT)
- Iron (Fapas and LGC AXIO PT)
- Zinc (Fapas and LGC AXIO PT)
- Cobalt (LGC AXIO PT)
- Copper (FAPAS and LGC AXIO PT)
- Coccidiostats (Fapas)
- Vitamin E (Fapas)

Although there are several companies worldwide that are flagged on the EPTIS database as organising PTs relating to feed, when they are reviewed it becomes apparent that many of the entries are out of date and have not been updated for several years. Also, the majority of the schemes appear to focus on analyte groups such as mycotoxins or metals and elements, there are very few rounds relating to feed additives.

In conclusion, there are relatively few PTs for feed additives and there appears to be no more appropriate current commercial PTs available for feed analytes than those being offered by Fapas and LGC AXIO Proficiency Testing. Use of UK based suppliers for PTs also eliminates potential delays in deliveries from overseas and the associated potential issues with Customs.

Annex 2: Determination of vitamin A

Introduction

Issues with the method for the determination of vitamin A in feed with regards to reported issues with poor recoveries and variation in replicate results were raised by Official Laboratories. Therefore, a review of the method was carried out.

Methods for the determination of vitamin A

Three methods for the determination of vitamin A were reviewed. A summary of each method follows:

(1) COMMISSION REGULATION (EC) No 152/2009 Laying down the methods of sampling and analysis for the official control of feed, Annex IV, Methods of analysis to control the level of authorised additives in feed, A. determination of vitamin A

2 – 25 g sample plus 130 ml ethanol, approximately 100 mg BHT, 150 mg ascorbic acid and 50 mg EDTA. Heat to boiling and reflux for 5 minutes, then add 25 ml 50 % m/v potassium hydroxide solution and reflux for a further 25 minutes under a stream of nitrogen. With the aid of 250 ml water and 25 ml ethanol, transfer the solution to a separating funnel. Extract with 3 x 100 ml petroleum ether and 2 x 50 ml petroleum ether 40/60. Combine the ether extracts and wash with 100 ml portions of water until the solution is neutral to phenolphthalein. Filter through a phase separation filter paper into a 500 ml volumetric flask and dilute to volume with petroleum ether. Evaporate an appropriate volume of extract to dryness and redissolve the residue in a known volume of methanol.

This method is referred to throughout this report as the Feed method.

(2) BS EN 17547:2021 Animal feeding stuffs: Methods of sampling and analysis — Determination of vitamin A, E and D content — Method using solid phase extraction (SPE) clean-up and high-performance liquid chromatography (HPLC)

2 – 30g sample plus approximately 1 g of ascorbic acid, 100 mg BHT 130 ml ethanol and 30 ml potassium hydroxide / sodium sulphide solution. Heat to boiling and reflux for 30 min under a slow stream of nitrogen. Transfer 40 ml of the

supernatant to a 50 ml graduated flask and dilute to volume with ascorbic acid solution. Shake thoroughly to form a visually homogeneous emulsion and transfer 15 ml to a SPE column. Elute vitamin A from the SPE with 100 ml cyclohexane. Evaporate a known volume of extract to dryness and redissolve the residue in the same volume of methanol.

This method is referred to throughout this report as the SPE method.

(3) FCS-005: Determination of tocopherol, retinol, α and β-carotene in foods

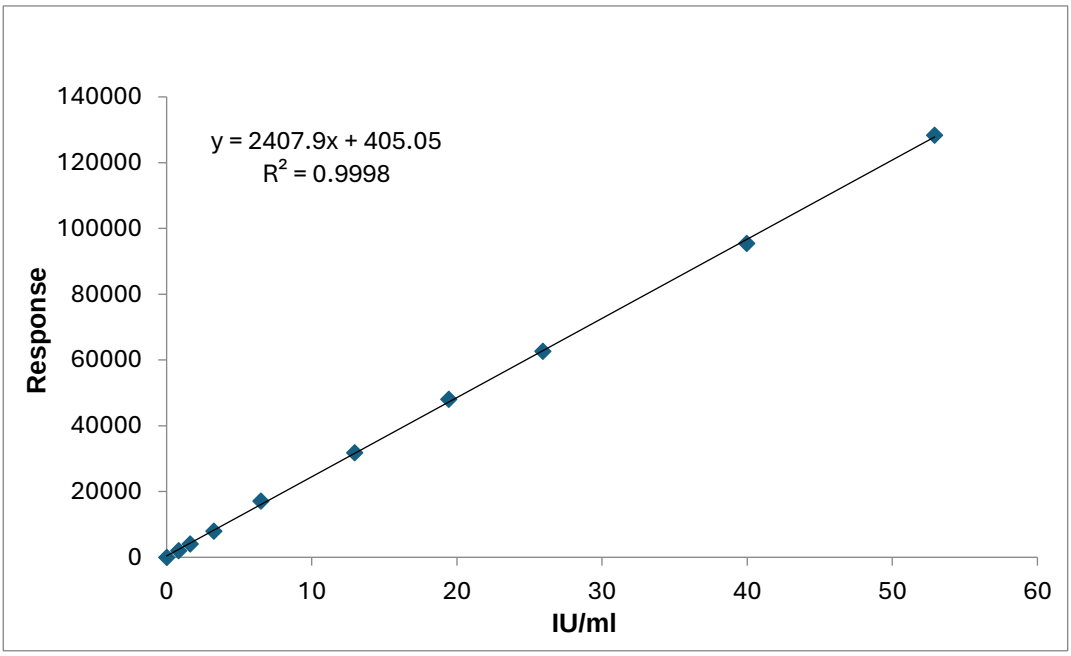
2 - 5g sample plus approximately 1g of sodium ascorbate as antioxidant, and 150ml ethanolic potassium hydroxide solution. Fit a water-cooled reflux condenser and bubble a stream of nitrogen through the solution via the side arm of the flask. Bring to the boil on an electric heating mantle and reflux for 30 minutes. Quantitatively transfer the saponification solution, whilst still warm to a 1 litre separating funnel using 150ml of water to aid the transfer. Extract with 2 x 250 ml mixed ethers (equal volumes of diethyl ether and petroleum ether 40/60). Combine the extracts and was repeatedly with 150 ml portions of water until the solution is neutral to phenolphthalein. Filter the ether extract through sodium sulphate and, after the addition of BHT as an antioxidant, evaporate to dryness. Redissolve the residue in a suitable, known, volume of methanol.

This method is referred to throughout this report as the Food method.

Linearity

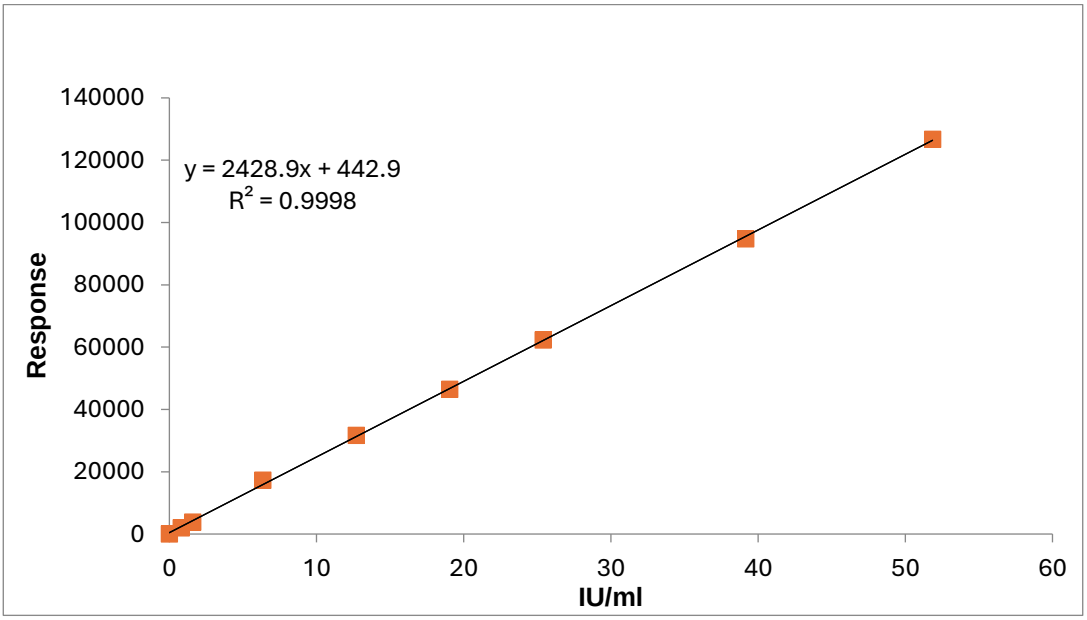
The method described in assimilated Regulation 152/2009 states that calibration standards should be prepared from solutions of either vitamin A acetate or vitamin A palmitate that have been taken through the extraction then concentration process. The exact concentration of vitamin A in the final stock solution is then checked by UV at a wavelength of 325 nm and $E^{1\%}_{1cm}$ of 1832. This method states that calibration standards should be prepared at the following concentrations: 2.8, 5.6, 14.0 and 28.0 IU vitamin A / ml. To assess the linearity of vitamin A, an extended calibration was prepared, as described in 152/2009, from a solution of retinyl acetate. In addition to the concentrations stated in the method, standards at approximately 0.8, 1.6, 40 and 53 IU/ml were also prepared, and it can be seen from Figure A2.1, vitamin A was linear over this range with a R^2 value of 0.9998.

Figure A2.1: Linearity of vitamin A (calibration standards prepared using retinyl acetate)



Calibration standards were also prepared directly from a solution of retinol at similar concentrations to the above. Figure A2.2 shows that these standards were linear over this range with a R^2 of 0.9998 and a slope and intercept similar to that obtained from standards prepared from retinyl acetate.

Figure A2.2: Linearity of vitamin A (calibration standards prepared using retinol)



As the linearity has been shown to be acceptable for a concentration range greater than that given in 152/2009 for two independent ways of preparation (retinyl acetate taken through the extraction procedure described in 152/2009, and directly from a solution of retinol), it can be taken that, providing concentrations of vitamin A are not determined outside these ranges unless linearity is confirmed, standard preparation and calibration range is not a contributing factor to variation in results and recoveries.

Standard stability

The concentration of a vitamin A working standard was checked periodically by UV to assess the stability of the solution. The standard solution was stored in a refrigerator and, prior to use, allowed to come to room temperature before an aliquot was diluted appropriately and the absorbance measured. The vitamin A concentration was calculated according to 152/2009 using the calculation IU vitamin A /ml = E 325 × 18.3 ($E^{1\%}_{1cm}$ for vitamin A alcohol = 1 821 at 325 nm in 2-propanol). 1 IU retinol is equivalent to 0.3 µg.

There was little change in the concentration of the solution over 10 days, however, over the longer term an apparent increase of approximately 9 % was recorded, possibly due to solvent evaporation. The concentration of the stock vitamin A solution used was checked by UV each time an analysis batch was carried out.

Table A2.1: Stability of vitamin A standard solution

Day	Concentration (µg/ml)
1	162.01
3	162.45
10	164.63
123	171.62
137	173.36
144	176.42

Instrument repeatability

Multiple injections of standard solutions were made onto the HPLC with either UV or FL detection to establish instrument repeatability; the results are given in Table A2.2.

Table A2.2: HPLC repeatability

	Response - UV detection	Response - FL detection
1µg/ml vitamin A	8533	21625
	8445	24524
	8445	22647
	8471	22790
	8464	21461
	8436	22727
Mean	**8465**	**22629**
%CV	**<1**	**5**
3µg/ml vitamin A	25342	62398
	25405	60262
	26745	59793
	26957	56595
	26089	55940
	27461	49915
Mean	**26333**	**57484**
%CV	**3**	**8**

Feed method

Feed samples provided by an Official Laboratory were analysed using the method for the determination of vitamin A described in Regulation EC 152/2009. 152/2009 states that ‘Vitamin A is separated on a C18 reversed phase column and the concentration is measured by means of a UV detector (325 nm) or a fluorescence detector (excitation: 325 nm, emission: 475 nm)’. As the method gives the option for detection with either UV or fluorescence, extracts were analysed using both detection methods so that a comparison could be made. Table A2.3 gives the results for 5 replicates of a compound feed sample by both UV and fluorescence detection (the same extracts were analysed by HPLC-UV, and then by HPLC-FL).

Table A2.3: Replicate results determined by UV and fluorescence detection for vitamin A in a sample of compound feed

Sample	Replicate	Retinol IU/kg UV detection	Retinol IU/kg FL detection
Compound feed	1	7763	7301
Compound feed	2	6422	6230
Compound feed	3	7305	7018
Compound feed	4	6348	5910
Compound feed	5	6560	6131
	Mean	6880	6518
	% CV	9	9

For this analysis there was approximately 5 % difference between the results using the two detection methods, with the results using fluorescence detection always being lower. However, the variation between replicates for each detection method (highest result - lowest result / mean x 100) is around 20%, so in comparison the difference between detection methods is small. For repeatability Regulation 152/2009 states that 'the difference between the results of two parallel determinations carried out on the same sample must not exceed 15 % relative to the higher result'; the results for this sample would not meet this criterion.

The variation between replicates was similar for both UV and fluorescence (CV = 9 %) indicating that the disparity in results is most likely due to either matrix or extraction issues rather than detection method.

Sample preparation

To assess whether variation in vitamin A results was due to inhomogeneity, a sample was inspected. Figure A2.3 shows the sample as received; the sample was generally a fine consistency with a small amount of larger fibrous pieces. A portion of the sample was taken and further ground in a coffee mill, the resulting sample is shown in Figure A2.4.

Figure A2.3: Compound feed sample as received

Figure A2.4: Compound feed sample after additional grinding

Six replicates of the sample, ground and unground, were analysed for vitamin A content using the method from 152/2009; the results are shown in Table A2.4. To note, the 6 replicates for the ground and as received samples were each labelled as

A, B, etc, but the results are independent and the results labelled A, B, etc are not linked in any way.

Table A2.4: Comparison of results for ground and as received feed sample

Sample	Sample as received - UV detection (IU/kg)	Sample ground before analysis - UV detection (IU/kg)
1360175 A	909	23008
1360175 B	2956	3887
1360175 C	6411	18036
1360175 D	6125	7012
1360175 E	11460	1873
1360175 F	1266	7102
Mean	4854	10153

As can be seen from Table A2.4, for this sample, the vitamin A concentration determined on the ‘as received’ portion were considerably lower than the sample portion that had been further ground (as received ranging from 909 to 11460 IU/kg and the further ground sample ranging from 1873 to 23,008 IU/kg). However, while the determined concentrations differed, the variation between replicates were similar at around 82 %.

Analysis of a food Quality Control (QC) material

Multiple replicates of a baby food QC material (Fapas T21129QC powdered baby food) were analysed so that a comparison of the repeatability of a different matrix could be compared to the repeatability of a feed sample when analysed using the same (feed) method (152/2009). The assigned value for vitamin A in the baby food sample was 450 µg/100g, with a satisfactory range of 302 to 597 µg/100g. This is equivalent to an assigned value of 14,985 IU/kg with a satisfactory range of 10,057 to 19,880 IU/kg.

Table A2.5: Vitamin A concentration in a baby food QC

Sample	Vitamin A IU/kg – FL detection	Vitamin A IU/kg – UV detection
T21129QC A	19660	18955
T21129QC B	11760	16359
T21129QC C	14752	14434
T21129QC D	16636	15552
T21129QC E	13638	13598
T21129QC F	16996	16876
Mean	15574	15962
% CV	18	12

The results for all 6 replicates were within the acceptable range, with detection by UV and fluorescence giving similar mean results. However, the variation between replicates was noticeable.

Comparison of methods using rabbit feed

To try and establish if the variation in results observed in the feed samples supplied by the Official Laboratory was due to the samples themselves or the method, a retail sample of rabbit feed was purchased and ground to a fine powder to use as an in-house quality control material. Multiple replicates of the rabbit feed (Pets at Home Nuggets for adult rabbits with pumpkin, mint and nettle, 18,000 IU/kg vitamin A (retinyl acetate)) were analysed by the three different methods described at the beginning of this report and the mean result for vitamin A by each method is shown in Table A2.6.

Table A2.6: Summary of mean results of vitamin A in a sample of rabbit feed determined by 3 methods

Method	**Mean (IU/kg)**
Food	14503
Feed	12637
SPE	9080

Table A2.7: % CV for vitamin A in a sample of rabbit feed determined by 3 methods

Method	Number of results	% CV
Food	6	9.3
Feed	13	24.9
SPE	4	28.1

As can be seen from the results in Table A2.6 there was a significant difference between the results obtained by the three different methods. Also, the % CV indicated that the performance of each method varied.

Conclusion

The review of the methods for the determination of vitamin A showed that the methods are broadly fit for purpose. The issues encountered with repeatability on the samples in question appear to be sample related as largely different % CVs were obtained for different sample types.

It is possible that specific technology employed to incorporate the vitamin A into the sample (e.g. encapsulation) are causing variation in the repeatability. It is also possible that other effects during the sample preparation stage may influence the homogeneity of the sample (e.g. static effects). To fully investigate and understand these issues would require further analytical work along with cooperation and technological input from the manufacturer of the feed / feed additive.

Annex 3: OL accreditation status

Laboratory	UKAS accreditation status - Feed / Feed additives August 2024	Changes from August 2024 to March 2025
Hampshire Scientific Services	No reference to feed.	No change.
Kent Scientific Services	Accredited for chemical tests and related **opinions and interpretations** in animal feedingstuffs - Aflatoxins B1, B2, G1 and G2, Ash, Crude fibre, Copper, Inorganic arsenic, Lead and cadmium, Melamine, Moisture, Nitrogen, Oil, Vitamin A and Vitamin E, Total mercury, Fumonisins B1 and B2 (cereal based feedingstuffs). Accredited in food and animal feeds - Arsenic, Histamine, Mercury. Accredited in Beer, Cereals and Cereal based feedingstuffs - Deoxynivalenol, T2 and HT2 toxins Accredited in unspecified foods and animal feeds - Additives, colourings, preservatives and related contaminants & composition - Development and modification of methods for food and feed analysis using **generic** in-house method for the techniques HPLC, LC/MS, GC, GC/MS, AAS, UV VIS, spectrophotometry, microscopy, ELISA and wet chemistry (drying, weighing and titration).	'Elements' and the technique ICP-MS have been added to the following flexible scope - Accredited in unspecified foods and animal feeds - Additives, colourings, preservatives and related contaminants & composition - Development and modification of methods for food and feed analysis using **generic** in-house method for the techniques HPLC, LC/MS, GC, GC/MS, AAS, UV VIS, spectrophotometry, microscopy, ELISA and wet chemistry (drying, weighing and titration).
Lancashire County Scientific Services	Accredited in animal feeding stuffs - Ash, Crude oil and fat, Fibre, Moisture, Protein, Vitamin A, Vitamin E, Cadmium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Selenium and Zinc. Accredited in animal feeding stuffs and food - Additives, contaminants and food composition - Development and modification of methods and analyses for food and animal feed enforcement purposes: **Generic** Protocol using High Performance Liquid Chromatography with UV, RI, Fluorescence detection, Gas Chromatography using FID, UV/Vis spectrophotometry, Flame Atomic Absorption Spectrophotometry (AAS), Electrothermal AAS, Hydride generation AAS, Ion Chromatography (IC), Inductively Coupled Plasma Mass Spectrometry (ICPMS). Accredited in animal feeding stuffs and food - Allergens, Contaminants (mycotoxins) and Meat Speciation - Development and modification of methods and analyses for food and animal feed enforcement purposes: **Generic** Protocol using	No change.

	commercially available Enzyme Linked Immunosorbent Assay (ELISA) kits.	
Aberdeen Scientific Services (Aberdeen City Council)	Accredited in animal feeding stuffs - Aflatoxins B1, B2, G1 and G2, Ash, Lead and cadmium, Mercury, Moisture, Nitrogen, Oil and Contaminants and composition using **generic** in-house procedure for the techniques GC, HPLC, AAS, ICP-OES, UV/Visible Spectrophotometry, Microscopy and Classical Techniques. Accredited in animal feeding stuffs, bread and bread products - Crude fibre. Accredited in animal feeding stuffs, food and food products - Vitamin A and vitamin E.	No change.
Dundee City Council Scientific Service (Tayside Scientific Services)	Accredited in animal feeding stuffs - Aflatoxins B1, B2, G1 and G2 and Ochratoxin A, Zearalenone, Ash, Crude fibre, Moisture, Oil, Nitrogen and protein, Vitamins A and E, Cobalt, Copper, iron, Manganese, Zinc, Cadmium, Lead, Arsenic and Selenium. Accredited in animal feeding stuffs - **Flexible** scopes for Compositional Analysis, Additives, colourings, preservatives and related contaminants, Determination of Elements and Foreign Body identification using HPLC, GC, GC-MS, UV spectroscopy, AAS, ICP-OES, Light microscopy, gravimetric, titrimetric and other classical wet chemistry techniques. Accredited in Animal Feeding Stuffs, Foods and Waters - **Flexible** scope for Detection and/or determination of DNA sequences for speciation, genetically modified organisms (GMO's), allergens and microorganisms	Deoxynivalenol added to the list of analytes accredited in animal feedingstuffs.
Edinburgh Scientific Services (The City of Edinburgh Council)	Accredited in animal feeding stuffs - Aflatoxins - B1, B2, G1, G2, Ochratoxin A, Ash, Acid insoluble ash, Crude fibre, Oil/fat, Moisture, Nitrogen, Protein, Arsenic, Cadmium, Cobalt, Copper, Lead, Mercury, Selenium and Zinc, Vitamins A and E, Isolation and confirmation of Salmonella spp. Accredited in foods and food products, animal feeding stuffs, and environmental samples - Detection and Identification of Bacteria DNA using Specific Genomic Sequences	No change.
Glasgow Scientific Services	Accredited in feeding stuffs - Ash, Crude fibre, Crude oils and fats, Moisture, Nitrogen, Protein, Crude protein, Cadmium, Copper, Lead, Selenium, Zinc, Calcium, Iron, Magnesium, Manganese, Phosphorus, Vitamin A, Vitamin E	No change.

Minton, Treharne and Davies Limited	Accredited in animal feeding stuffs - Ash, Crude fibre, Moisture, Nitrogen and protein, Oil and **Generic** protocol for the development of methods of analysis under **flexible** scope using gas chromatography, high performance liquid chromatography, UV-Vis spectroscopy, enzyme linked immunoassay (ELISA), microscopy, titrimetry and gravimetry	No change.
Public Analyst Scientific Services, Wolverhampton	No reference to feed / feed additives.	No change.

Annex 4: GB feed additive legislation summary

Under the Government Chemist programme regular reviews of legislation relating to feed and food are regularly carried out.

The following legislation relating to feed additives was published in Great Britain.

The Feed Additives (Authorisations) and Uses of Feed Intended for Particular Nutritional Purposes (Amendment of Commission Regulation (EU) 2020/354) (England) Regulations 2024 make an amendment to the feed for particular uses Regulations and authorise / re-authorise a number of feed additives in England. Similar Regulations apply in Scotland The Feed Additives (Authorisations) and Uses of Feed Intended for Particular Nutritional Purposes (Miscellaneous Amendment) (Scotland) Regulations 2024 and in Wales The Feed Additives (Authorisations) and Uses of Feed Intended for Particular Nutritional Purposes (Amendment of Commission Regulation (EU) 2020/354) (Wales) Regulations 2024 and in Welsh.

The feed additives that were authorised in this legislation were:

- Chromium chelate of DL-methionine for dairy cows
- *Pediococcus acidilactici* (CNCM I-4622) (identification number 4d1712) for all animal species
- L-histidine monohydrochloride monohydrate produced by fermentation with *Escherichia coli* K-12 (KCCM 80212) (identification number 3c352i) for all animal species
- L-tryptophan produced by fermentation with *Escherichia coli* (KCCM 80210) (identification number 3c440i) for all animal species
- L-lysine sulphate produced by fermentation with *Corynebacterium glutamicum* (KCCM 80227) (identification number 3c324i) for all animal species
- Butylated hydroxyanisole (identification number 1b320) for cats
- L-lysine base (liquid) produced by fermentation with *Corynebacterium glutamicum* (KCCM 80183) (identification number 3c320) for all animal species

- L-lysine monohydrochloride (technically pure) produced by fermentation with *Corynebacterium glutamicum* (KCCM 80183) (identification number 3c322ii) for all animal species
- Disodium 5’ -guanylate (GMP) produced by fermentation with *Corynebacterium stationis* (KCCM 10530) and Escherichia coli K-12 (KFCC 11067) (identification number 2b627i) for all animal species
- Muramidase (EC 3.2.1.17) produced by fermentation with *Trichoderma reesei* (DSM 32338) (identification number 4d16) for weaned piglets
- Phytomenadione (Vitamin K1) (identification number 3a712) for horses
- Fumonisin esterase (EC 3.1.1.87) produced by fermentation with *Komagataella phaffii* (DSM 32159) (identification number 1m03i) for all animal species, for use only in maize-based silages

Authorisation as feed additives was renewed for:

- *Saccharomyces cerevisiae* (MUCL 39885) (identification number 4b1710) for weaned piglets, and its authorisation extending to the use for cats, dogs and all Suidae other than sows and suckling piglets
- Monensin sodium produced by fermentation with *Streptomyces cinnamonensis* 28682 (NBIMCC 3419) (carrier: perlite, calcium carbonate) (identification number 51701) for chickens for fattening, chickens reared for laying and turkeys for fattening, and its authorisation extending to the use for turkeys reared for breeding
- Monensin sodium produced by fermentation with *Streptomyces cinnamonensis* 28682 (NBIMCC 3419) (carrier: perlite, calcium carbonate) (identification number 51701) as a feed additive for chickens for fattening, chickens reared for laying and turkeys for fattening, and its authorisation extending to the use for turkeys reared for breeding
- 6-phytase (EC 3.1.3.26) produced by fermentation with *Komagataella phaffii* (formerly *Komagataella pastoris*) (DSM 23036) (identification number 4a16) for chickens for fattening, chickens reared for laying, laying hens, turkeys for

fattening, turkeys reared for breeding, other avian species for fattening and laying, sows, pigs for fattening and weaned piglets, and its authorisation extending to the use for all avian species and all *Suidae*

- *Bacillus velezensis* (formerly *Bacillus subtilis*) (DSM 15544) (identification number 4b1820) for weaned piglets, chickens reared for laying, turkeys, minor avian species, ornamental birds and game birds; consolidation of existing authorised uses for laying hens and chickens for fattening; and its authorisation as a feed additive extending existing authorised uses to cover all other avian species
- Copper chelate of hydroxy analogue of methionine (identification number
- 3b410i (formerly 3b4.10)) for all animal species
- Manganese chelate of hydroxy analogue of methionine (identification
- number 3b510 (formerly 3b5.10)) for all animal species
- Zinc chelate of hydroxy analogue of methionine (identification number
- 3b610 (formerly 3b6.10)) for all animal species

Annex 5: EU feed additive legislation summary

The following legislation relating to feed additives was published in the EU.

Renewals

- *Bifidobacterium animalis ssp. animalis* DSM 16284, *Ligilactobacillus salivarius* DSM 16351 and *Enterococcus faecium* DSM 21913 for chickens for fattening, chickens reared for laying and minor poultry species for fattening and reared for laying or breeding, the authorisation of that preparation as a feed additive for use in feed and in water for drinking for chickens reared for breeding, turkeys for fattening and turkeys reared for breeding
- *Enterococcus lactis* NCIMB 10415 for certain animal species, the authorisation of that preparation for certain other animal species
- Endo–1,4-beta-xylanase produced by *Aspergillus oryzae* DSM 33700 for poultry for fattening, weaned piglets, pigs for fattening, lactating sows and laying hens, the change of the terms of the authorisation and authorisation of new uses of that preparation for all poultry species and all Suidae
- *Lentilactobacillus buchneri* NCIMB 30139 for all animal species
- *Levilactobacillus brevis* DSM 23231 for all animal species
- *Lentilactobacillus buchneri* DSM 19455 for all animal species
- *Lactiplantibacillus plantarum* LMG P-21295 for all animal species
- *Enterococcus lactis* DSM 7134 and *Lacticaseibacillus rhamnosus* DSM 7133 for calves for rearing
- *Lactiplantibacillus plantarum* DSM 3676, *Lactiplantibacillus plantarum* DSM 3677 and *Lentilactobacillus buchneri* DSM 13573 for all animal species
- *Enterococcus lactis* DSM 7134 for chickens reared for laying and minor poultry species for fattening, reared for laying and reared for breeding
- Ammonium chloride for ruminants, cats and dogs

- Sodium hydroxide for cats, dogs and ornamental fish
- Orthophosphoric acid for all animal species
- Nicotinic acid and niacinamide for all animal species
- Preparation of *Enterococcus lactis* DSM 22502 for all animal species
- Preparation of *Pediococcus pentosaceus* DSM 23688 for all animal species
- Preparation of *Pediococcus pentosaceus* DSM 23689 for all animal species
- Preparation of *Enterococcus lactis* NCIMB 10415 for cats and dogs
- Preparation of *Lentilactobacillus buchneri* DSM 22501 for all animal species
- Sodium bisulphate and the authorisation of new uses of that substance for certain animal species
- Preparation of *Bacillus velezensis* ATCC PTA-6737 as a feed additive for turkeys for fattening, turkeys reared for breeding, weaned piglets, weaned Suidae other than Sus scrofa domesticus, and sows, its authorisation for pigs for fattening of all Suidae species, suckling piglets of all Suidae species and sows of minor Suidae species

Authorisations

- *Weizmannia faecalis* DSM 32016 for use in feed and in water for drinking for all poultry species reared for laying or breeding and for use in water for drinking for all poultry species for fattening, ornamental birds, suckling and weaned Suidae piglets
- Endo-1,4-beta-mannanase produced with *Thermothelomyces thermophilus* DSM 33149 for all poultry species for fattening and ornamental birds
- *Duddingtonia flagrans* NCIMB 30336 for grazing animals for milk production of bovine species, sheep and goats
- *Lactiplantibacillus plantarum* DSM 11520 for horses, dogs, cats and rabbits
- *Saccharomyces cerevisiae* MUCL 39885 for cats

- 6-phytase produced by *Komagataella phaffii* CGMCC 7.19 for all poultry species for fattening or reared for laying and ornamental birds
- Glycosylated 1,25-dihydroxycholecalciferol from *Solanum glaucophyllum* extract for dairy cows
- Cyanocobalamin (vitamin B12) produced with *Ensifer adhaerens* CGMCC 21299 for all animal species
- Riboflavin 5'-phosphate monosodium salt (vitamin B2), produced by Bacillus subtilis KCCM 10445 for all animal species
- L-valine produced by *Corynebacterium glutamicum* CGMCC 18932 for all animal species
- Benzoic acid for weaned piglets and pigs for fattening
- Acetic acid, calcium acetate and sodium diacetate for fish
- Manganese(II) – betaine complex for all animal species
- Iron(II) – betaine complex for all animal species
- Cassia essential oil from *Cinnamomum aromaticum Nees* for certain animal species
- Rosemary extract for cats and dogs
- Cinnamon bark essential oil and cinnamon leaf essential oil from *Cinnamomum verum J. Presl* for certain animal species
- Undec-10-enal, terpineol acetate, d,l-borneol, l-carvone, d-camphor, d,l-isobornyl acetate, 3-propylidenephthalide, phenylacetic acid, methyl salicylate, thymol, carvacrol, benzothiazole, terpinolene, d,l-isoborneol, trans-menthone, d,l-bornyl acetate, 3-butylidenephthalide, phenylacetaldehyde, phenethyl acetate, phenethyl phenylacetate, methyl phenylacetate, ethyl phenylacetate, isobutyl phenylacetate, 3-methylbutyl phenylacetate, 2-methoxyphenol, 2-methoxy-4-methylphenol, 4-ethylguaiacol, 2-methoxy-4-vinylphenol, 4-ethylphenol, 2-methylphenol, 4-methylphenol, 2,6-dimethoxyphenol, phenol, 2,6-dimethylphenol, 2-isopropylphenol, benzene-

1,3-diol, alpha-phellandrene, alpha-terpinene, gamma-terpinene and l-limonene for all animal species and amending the terms of authorisation of d,l-isomenthone for all animal species

- Coriander essential oil from *Coriandrum sativum L*. for all animal species
- Pine white essential oil from *Pinus pinaster Aiton* for all animal species
- Preparation of semduramicin sodium for chickens for fattening
- 4-methyl-5-vinylthiazole for all animal species
- Preparation of *Bacillus subtilis* FERM BP-07462, *Enterococcus lactis* FERM BP-10867 and *Clostridium butyricum* FERM BP-10866 for all poultry species for fattening, all poultry species reared for laying or breeding and ornamental birds
- Preparation of fumonisin esterase produced with *Komagataella phaffii* NCAIM (P) Y001485 for piglets and pigs for fattening of all Suidae species
- Preparation of endo-1,4-beta-xylanase, endo-1,4-beta-glucanase and xyloglucan-specific-endo-beta-1,4-glucanase produced with *Trichoderma citrinoviride* DSM 33578 for sows of all Suidae species
- Preparation of 6-phytase produced with *Aspergillus oryzae* DSM 33737 for all poultry species for fattening or reared for laying or reared for breeding, sows of all Suidae species and all fin fish
- Juniper essential oil and juniper tincture from *Juniperus communis L*. for all animal species
- Cyanocobalamin (vitamin B12) produced with *Ensifer adhaerens* CGMCC 19596 as a feed additive for all animal species
- Preparation of zinc-L-selenomethionine as a feed additive for all animal species
- Ferric tyrosine chelate as a feed additive for all poultry species for fattening, all poultry species reared for laying, and turkeys and minor poultry species reared for breeding

Withdrawals

Commission Implementing Regulation (EU) 2024/1727 of 20 June 2024 withdrawing from the market certain feed additives, lists a number of feed additives which are to be withdrawn from the EU market as no applications for authorisation renewal, as required by Article 10(2) of Regulation (EC) No 1831/2003, were submitted before the deadline provided for in that provision.

In the case of feed additives for which applications have been submitted only for certain animal species or categories, or applications that have been withdrawn only for certain animal species or categories, the withdrawal from the market only concerns the animal species and categories for which no application was submitted or for which the application has been withdrawn.

The feed additives for withdrawal listed in Regulation (EU) 2024/1727 are:

Flavouring and appetising substances for all species

- *Citrus sinensis (L.) Osbeck = Citrus sinensis (L.) Pers*. = *Citrus aurantium L. var. dulcis*: Folded orange oil
- *Echinacea angustifolia DC*.: Blacksamson echinacea tincture
- *Hypericum perforatum L*.: St. John's wort tincture CoE 234
- *Linum usitatissimum L*.: Linseed tincture CoE 263
- *Thymus mastichina L*.: Spanish marjoram oil

Preservatives

- Lactic acid for Ruminants with a non-functional rumen
- Ammonium formate for laying hens, sows, dairy ruminants, pet and non- food producing animals
- Calcium lactate for ruminants with a non-functional rumen

Colourants, including pigments

- Erythrosine for ornamental fish and reptiles

Flavouring and appetising substances (for animal species and categories see Regulation (EU) 2024/1727)

- *Anethum graveolens L.*: Dill herb essential oil
- *Angelica sinensis (Oliv.) Diels*: Dong quai tincture
- *Boswellia serrata Roxb. ex Colebr.*: Olibanum extract
- *Citrus aurantiifolia (Christm.) Swingle*: Distilled lime essential oil
- *Citrus aurantium L.*: Petitgrain bigarade essential oil
- *Citrus x aurantium L.*: Bitter orange extract
- *Citrus limon (L.) Osbeck*: Expressed lemon essential oil
- *Citrus limon (L.) Osbeck*: Residual fraction of expressed lemon oil distilled
- *Citrus reticulata Blanco.*: Expressed mandarin essential oil
- *Citrus sinensis (L.) Osbeck* = Citrus sinensis (L.) Pers. = *Citrus aurantium L. var. dulcis*: Distilled orange essential oil
- *Citrus sinensis (L.) Osbeck = Citrus sinensis (L.) Pers. = Citrus aurantium L. var. dulcis*: Expressed orange essential oil
- *Citrus sinensis (L.) Osbeck = Citrus sinensis (L.) Pers. = Citrus aurantium L. var. dulcis*: Folded orange oil
- *Curcuma longa L.*: Turmeric tincture
- *Eleutherococcus senticosus (Rupr. et Maxim.) Maxim.*: Taiga root tincture
- Ferula assa-foetida L.: Asafoetida oil
- *Litsea cubeba (Lour.) Pers.*: Litsea berry essential oil
- *Panax ginseng C. A. Mey.*: Ginseng tincture CoE 318
- *Piper nigrum L.*: Black pepper supercritical extract
- *Schisandra chinensis (Turcz.) Baill*: Omicha tincture

- *Zingiber officinale Roscoe*: Ginger oleoresin CoE 489
- *Zingiber officinale Roscoe*: Ginger tincture

Natural products and corresponding synthetic products for marine animals

- Geraniol
- Cinnamyl alcohol
- 3,7,11-Trimethyldodeca-2,6,10-trien-1-ol
- 3-Phenylpropan-1-ol
- (Z)-Nerol
- Citral
- 2-Phenylpropanal
- 3-(p-Cumenyl)-2-methylpropionaldehyde
- Alpha-Methylcinnamaldehyde
- 3-Phenylpropanal
- Cinnamic acid
- Geranyl acetate
- Cinnamyl acetate
- Geranyl butyrate
- Cinnamyl butyrate
- Geranyl formate
- Geranyl propionate
- Neryl propionate
- Neryl formate
- Neryl acetate

- Neryl isobutyrate
- 3-Phenylpropyl isobutyrate
- Geranyl isobutyrate
- Cinnamyl isovalerate
- Cinnamyl isobutyrate
- Prenyl acetate
- Ethyl cinnamate
- Methyl cinnamate
- Isopentyl cinnamate

Artificial substances

- Sodium saccharin for piglets

Corrections, amendments and corrigendum

- Commission Implementing Regulation (EU) 2024/1839 correcting Implementing Regulation (EU) 2023/2846 by deleting *Schinopsis lorentzii (Griseb.) Engl.* as a source of the feed additive red quebracho extract
- Commission Implementing Regulation (EU) 2024/2183 amending Implementing Regulations (EU) No 389/2011, (EU) No 2016/899, (EU) 2017/440, (EU) 2017/896, (EU) 2020/164, (EU) 2020/166, (EU) 2021/2051, (EU) 2021/2096, (EU) 2023/1167, (EU) 2023/1703 and (EU) 2023/1713 as regards the name of the holder of the authorisation for feed additives
- Commission Implementing Regulation (EU) 2024/2039 correcting Implementing Regulation (EU) 2023/1173 by deleting feed additives from the Annex thereto.
- Corrigendum to Commission Implementing Regulation (EU) 2024/2427 concerning the authorisation of coriander essential oil from *Coriandrum sativum L*. as a feed additive for all animal species

- Corrigendum to Commission Implementing Regulation (EU) 2024/2464 concerning the authorisation of pine white essential oil from *Pinus pinaster Aiton* as a feed additive for all animal species
- Corrigendum to Commission Implementing Regulation (EU) 2024/2414 concerning the authorisation of juniper essential oil and juniper tincture from *Juniperus communis L*. as feed additives for all animal species

Glossary of Acronyms

AAS	Atomic absorption spectrometry
DNC	4,4'-dinitrocarbanilide
ELISA	Enzyme-linked immunosorbent assay
FID	Flame ionisation detector
FSA	Food Standards Agency
FSS	Food Standards Scotland
GC	Gas chromatography
GC-MS	Gas chromatography mass spectrometry
GMO	Genetically modified organism
HPLC-FL	High-performance liquid chromatography - Fluorescence detection
HPLC-UV	High-performance liquid chromatography - UV detection
IC	Ion chromatography
ICP-MS	Inductively coupled plasma mass spectrometry
ICP-OES	Inductively coupled plasma optical emission spectroscopy
LC-MSMS	Liquid chromatography with tandem mass spectrometry
LOD	Limit of detection
NIR	Near-infrared
NIRS	Near-infrared spectroscopy
NRL	National Reference Laboratory
OL	Official Laboratory
PCR	Polymerase chain reaction
PT	Proficiency test
RASFF	Rapid Alert System for Food and Feed
RI	Refractive index
RP-HPLC	Reversed phase high performance liquid chromatography
UKAS	United Kingdom Accreditation Service