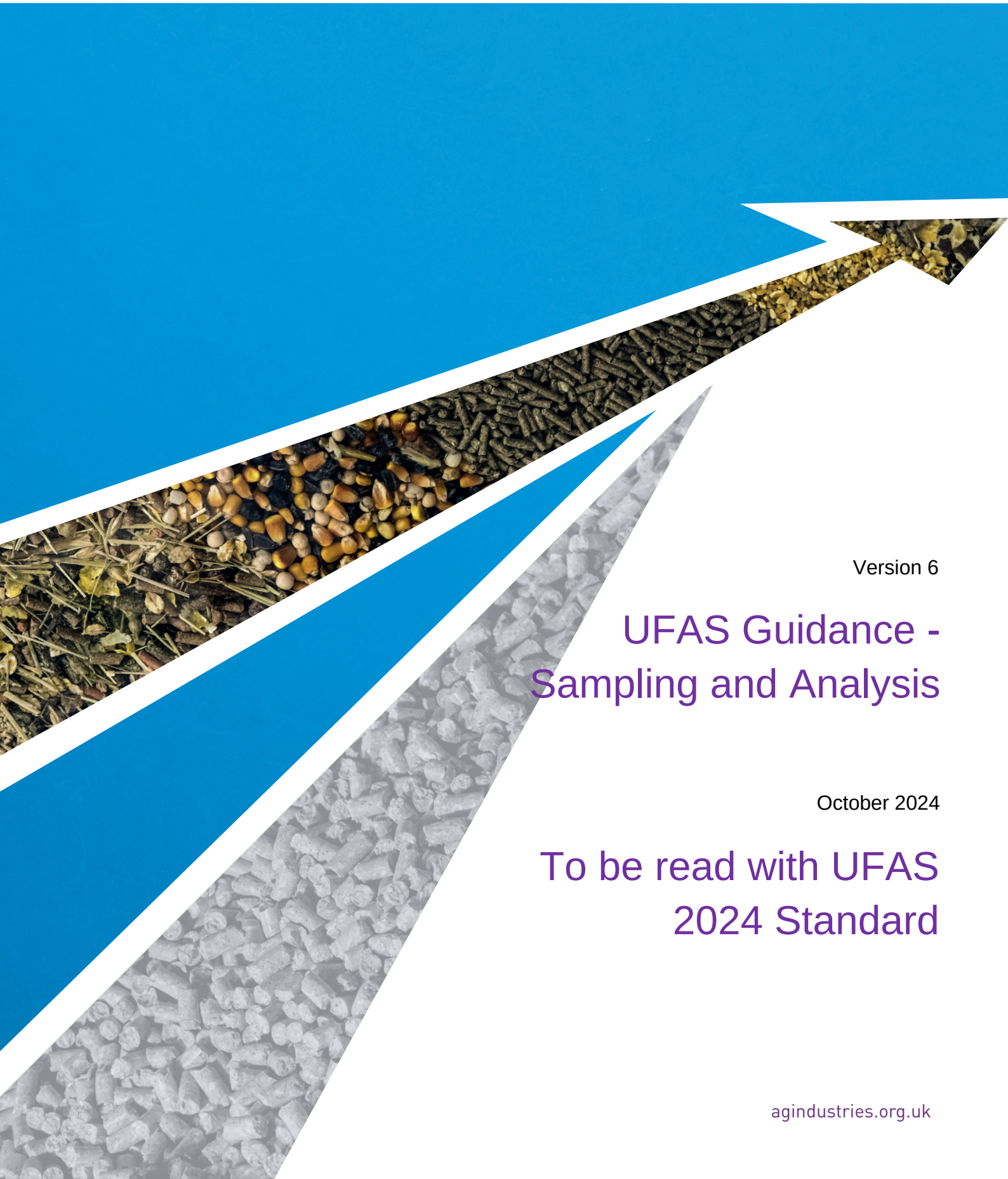
UFAS 2024



Version 6

# UFAS Guidance - Sampling and Analysis

October 2024

## To be read with UFAS 2024 Standard

agindustries.org.uk

# Contents

# 1. Introduction

An effective feed safety management system requires the development of a sampling, inspection and analysis schedule which considers many factors, some of them unique to the Participant, to ensure both nutritional integrity and feed safety are always maintained.

This guidance document can be used to develop a sampling and analysis schedule forming part of the Participant's Quality Management System.

This should include the frequency of sampling and the frequency of the types of analyses to be completed on feed ingredients, finished feeds and the plant environment.

This should cover both routine analysis, as well as that of process validation and verification.

Additionally, fundamental to the success of analytical work is the method used to obtain a representative sample, considering the homogeneity (or otherwise) of the feed being sampled.

Any sub-sampling or reduction of sample size prior to analysis should also be considered, as this is known to cause variation if not completed in a controlled manner.

# 2. Sampling

## 2.1 Size

This should be sufficient in size to enable initial testing and retention for future reference, investigations or additional testing. Typically, this would require approximately 250 grams as a minimum.

Retained samples should be of sufficient size to enable future retests if required.

## 2.2 Equipment

Tools should be suitable to permit a representative sample to be taken in a safe manner. Any sub-sampling should be completed in such a manner to maintain sample representation, the use of sample dividers should be considered.

## 2.3 Hygiene

Attention should be given to the hygiene of sampling equipment, ensuring use of clean equipment will avoid any sample contamination.

Additionally, samples taken for microbiological testing should be handled in accordance with the Defra/DAERA Code of Practice for the control of Salmonella to prevent contamination from the person taking the sample.

## 2.4 Labelling of samples

Sample storage bags or pots must be labelled immediately with sufficient information to allow subsequent traceability to the product delivered or manufactured.

### 2.5 Routine Sampling - Feed Ingredients

Where possible, bulk feed ingredient samples should be a composite of several samples from different points in the delivery, typically this is a minimum of three samples from the full depth and across the span of the load.

### 2.6 Routine Sampling - Finished Feeds

A representative sample for each delivery must be taken, preferably from the point of loading or alternatively from a final stage within the manufacturing process if sampling at loading is not feasible.

## 3 Sensory Inspection

It is also important to note that testing is not limited to laboratory analysis, and manual inspection has a place within sample assessments.

A visual or smell test of an incoming feed ingredient can also indicate whether the feed ingredient is mouldy, burnt or contaminated, and should form a part of the overall inspection of incoming feed ingredients and finished feeds.

It may be helpful to maintain a library of feed ingredient reference samples at the point of receipt. These may be physical samples or reference photographs.

## 4 Guidelines to Preparing an Analysis Schedule

The analysis schedule should enable the Participant to verify:

- compliance with legislative requirements
- the nutritional adequacy of products
- feed ingredient matrices used to formulate finished feeds.

The analysis of feed ingredients, finished feeds and plant environment will be driven by various factors including:

- Protection of human and animal health
- Company interpretation of due diligence
- Customer Requirements
- Company Quality Policy, Quality System and HACCP Study
- Contractual sampling

And should take into account:

- the manufacturing or merchanting process to be controlled
- whether it is multi or single species
- complexity and number of lines
- types and compatibility of products handled and manufactured
- feed ingredients used
- data available from other sources (including AIC schemes)
- stage of livestock growth cycle
- testing requirements including routine, in process, due diligence

Examples of typical analyses are given in:

- Appendix 1 (Feed Ingredients)
- Appendix 2 (Finished Feeds)

It is not always necessary for a Participant to do all the testing; data can be obtained from suppliers and other appropriate sources e.g. collaborative schemes.

Whatever the case, the Quality Management System should describe the source of all sampling, testing and data resulting from testing whether it is completed by the Participant, or a third party.

## 4.1 Protection of human and animal health

The testing requirements for the protection of human and animal health will be driven by an understanding of the feed ingredients, finished product types, manufacturing processes and types of storage. It is vital to consider the origin of a potential hazard:

- Could it arise from incoming feed ingredients?
- Could it arise from storage conditions?
- Could it be generated or worsened within production or the associated storage?

The answers to these questions help the decision on whether incoming feed ingredients or finished feed testing should be carried out. The greater the amount of control and checking of feed ingredients and within the process, can lessen the requirement for checking finished feeds.

### 4.1.1 Feed Ingredients

Feed ingredient assurance schemes are designed to ensure that there is adequate control and testing of feed ingredients. However this does not preclude the requirement to carry out a certain amount of testing on receipt; particularly for those ingredients where there may be a potential risk inherent in the material, its source or the way it has been stored or processed. These potential risks can be identified using the material's specification which should be available from the supplier.

The AIC Feed Safety Analysis Calculator is also a useful guide in understanding some of the potential risks involved.

### 4.1.2 Type of Manufacturing Plant and Species

Where the hazard could arise internally, i.e.: from storage, production or contamination within the plant, then analyses should concentrate on in-process or finished products.

For example, if a ruminant only plant is assessed, the potential hazards could be:

- Mycotoxins - from incoming feed ingredients
- Heavy Metals - from incoming feed ingredients
- Copper - internal contamination risk to sheep feeds

Of these copper is the potential manufacturing hazard, as it could be introduced by use of an incorrect premixture or other copper source, or contamination within the mill. Hence

adequate finished feed testing would be required to monitor the copper content, but the testing requirement may be lower to cover heavy metals or mycotoxins.

Where production sites are multi-species, the hazards which may be generated within them are increased and therefore a wider variety of finished products may require feed safety related analyses.

**Note:** It is not possible to provide a risk assessment guide to cover every possible risk for all sectors of the compound feed industry, however, the UFAS Participant must be aware of the known major hazards and how they arise. Manufacturers of feeds containing Controlled Products (VMPs and SFAs) must be aware of the risks specific to the products they handle.

## 4.2 Compliance with Legislation

Feed Legislation defines a range of potential testing required to demonstrate compliance.

The AIC website contains guidance on current legislation, and should be used to draw reference for this area.

https://www.agindustries.org.uk/sectors/animal-feed/resources/legislation-and-guidance.html

## 4.3 Compliance with UFAS

There are specific requirements for inspection, sampling and testing within UFAS detailed in:

- G 1 Intake;
- G 9 Operational Control;
- G 10 Process Cross-Contamination Controls;
- G 11 Manufacture of Premixtures, Mineral Feeds and Dietetic Feeds;
- G 13 Treatments used as a Salmonella Kill Step in Bulk Poultry Feeds;
- H Sampling and Analysis (including In-Process Evaluations such as Mixer Efficiency);
- Section K Feed Containing Controlled Products.

## 4.4 Company "due diligence" Requirements

It is the responsibility of suppliers to UFAS Participants to ensure their feeds are safe and legal, however the Participant may also have a requirement for some testing before using these feeds or placing products containing them onto the market as part of their 'Due diligence' procedures.

## 4.5 Contractual Sampling

Many feed ingredients purchased by UFAS Participants will be supplied under the terms of industry standard contracts, which may contain specific requirements for sampling and testing methods at intake.

### 4.5.1 AIC No.1 & No. 2 Grain & Pulses Contracts

It is a requirement of the AIC No.1 (First Purchaser) and No. 2 (Wholesale) Grain & Pulses Contracts that:

- Deliveries are sampled by the receiver at the final consignment point in accordance with ISO 24333

- Samples are analysed by using equipment calibrated to the reference methods specified in the TASCC Testing Facilities Code, or by an external laboratory using those reference methods

# 5. Controlled Product Recovery in Finished Feed and Premixtures

## 5.1 Method

Samples of finished feeds and premixtures containing Controlled Products must be selected using the routine samples and submitted for analysis according to the minimum requirements of the VMD guidelines:

- The square root of 1% of the medicated/specified feed additive tonnage produced per annum (minimum 1 sample)

The testing should take into account all of the VMPs and SFAs used on the manufacturing site where analysis is available.

## 5.2 Interpretation of results

Results must be reviewed to ensure they are within the permitted legal tolerances as detailed in the relevant legislation.

- Article 22, Schedule 5 of the Veterinary Medicines Regulations (as amended) for VMPs
- Article 11(5) and paragraph 2(e) of Annex IV to Regulation 767/2009 (as amended) for SFAs

# 6. In-Process Evaluations

These requirements verify that the manufacturing process is both effective and produces safe finished feeds.

## 6.1 Mixer Dispersion Testing

The UFAS Standard requires the performance of mixers to be established and verified where mixing (dispersion) forms an essential part of the process, the following method can be used for this purpose.

Consideration should be given to completing additional trials after engineering works have been completed on the plant.

If different batch sizes, or mixing times are used then trials should be carried out to confirm that the homogeneity of the mix is not compromised by batch size or mix time.

### 6.1.1 Method of Sampling

Prior to sampling determine the sampling interval by timing the duration of discharge of an earlier batch and divide this time by the number of samples required to establish the sampling interval.

- A single batch of feed is manufactured, containing the target parameter / s which typically could be a trace element or mineral such as Manganese or Zinc. Where non-

mineralised products are produced a suitable alternative method or analyte should be established to validate and verify the plant.

- A minimum of eight individual samples should be taken:
    - as close to the mixer discharge as possible
    - at equally timed intervals sampled from the beginning to the end of the batch discharge.
- Samples should be put into sequentially numbered bags and the complete set of individual samples sent for analysis.
- Mixing times and batch size should be recorded against the report, as well as the batch number for assessment and traceability purposes.

More accurate results may be achieved if samples are taken from a moving flow of feed.

### 6.1.2 Interpretation of Mixer Dispersion Results

Interpretation of the data must look at variation between samples. The normal measure for this test is the Coefficient of Variation (CV). This is a statistical measure which gives an indication of the degree of variation in levels across the batch. The calculation is as follows:

CV= (SD/Mean)*100

A maximum CV of 10% should be achieved, unless risk assessment demonstrates that a higher CV is acceptable, or a lower CV is required for maintaining Feed Safety.

In general, the CV result should be taken as a measure of the mixer performance and as such once a value for that mixer has been established then any deviation away from this should be investigated as it could indicate a hygiene and or mechanical issue.

In addition, the results of this analysis may be useful for other purposes such as establishing average recovery of the analyte.

## 6.2 In process Carryover and Cross Contamination Monitoring

The UFAS Standard requires monitoring of in process carryover and cross contamination at outloading/ packing. For some additives there are limits set in the Undesirable Substances Directive (as amended) for the amount of unavoidable carryover into a non-target of feed and is set by additive and species. Regulators are increasingly looking for businesses to achieve continuous improvement of carryover levels and expect levels to be “as low as reasonably practicable” (ALARP).

The analyte(s), target feeds and non-target feeds chosen for testing should be based upon risk assessment, and appropriate to the location where control is being established or checked. The risk assessment should consider:

- “worst case” scenarios i.e. maximum inclusion of the analyte vs. most sensitive following feed
- Variability of recovery of the analyte in laboratory analysis
- Covering a range of analytes to account for different characteristics

These could be VMPs, specified feed additives or feed additives added at the mixer. Trace elements such as copper can also be used but potential background and added levels in the following feed need to be considered.

Ensure the laboratory used is able to measure to a suitable limit of detection/ quantification and informing them in advance to ensure suitable dilution is applied to the test can reduce delays.

Magnetic, coloured microtracers may be used to measure carry-over, providing the method used has been validated and gives equivalent results to those given by a range of different veterinary medicinal products or specified feed additives with different physical properties. Some supplied products contain a microtracer so care should be taken to not obtain false results.

### 6.2.1 Method of Measuring Carryover

1. Manufacture a feed batch containing the feed ingredient for which the carryover is to be measured.
2. Take representative sample(s) of the batch to analyse for recovery / actual levels of the feed ingredient.
3. Manufacture a subsequent batch, that does not contain the feed ingredient being checked.
4. Samples of this subsequent batch should be taken at outloading / packing, unless a specific section of plant is being investigated. This could be a composite sample taken across the batch, or tested as individual samples, based on risk assessment.

The carryover is calculated from the recovery, or mean recovery, of the feed ingredient in the subsequent batch, expressed as a % of the concentration of the feed ingredient in the initial batch.

For example, a 3000 kg batch of feed containing the feed ingredient at 10 mg/kg is immediately followed by a batch of 3000 kg. Analysis shows this batch to contain an average of 1 mg/kg of the feed ingredient.

The target batch contains: 10mg/kg x 3000kg = 30000mg of the ingredient

The subsequent batch contains: 1mg/kg x 3000kg = 3000mg of the ingredient.

The carryover is the amount of ingredient found in the following batch expressed as a percentage of ingredient added to the original batch, therefore: (3000mg/30,000) x 100 = 10%

Where the maximum level of carryover is defined in legislation as a concentration (mg/kg) this must be checked.

Additional carryover tests can be carried out within key stages of the plant or process e.g. the mixer as part of an investigation into any cross contamination.

Tests must be undertaken for residues of Controlled Products on feed throughout the production route(s) to identify locations where cross contamination controls could be compromised at intervals of no more than 12 months for each production line such that all

plant combinations are assessed or more frequently if determined by risk assessment or plant performance.

### 6.2.2 Validation of the Effectiveness of a Flush (Clearance or Discard)

- The process is similar to that for carryover, but all sampling is carried out after a flush has been used to clear the system.
- This could be a flush at the mixer or at the press bin.
- Samples are taken post flushing, and at a point closest to the point of discharge to validate the effectiveness of this stage or at outloading to validate the whole process.
- the number of samples taken and the feed ingredient to be measured is determined by risk assessment and / or legal requirements.

### 6.2.3 Interpretation of Carryover and Cross Contamination Results

Consideration should be given to legislation, the danger to non-target species and food safety issues, with immediate action and follow-up where issues are identified.

Findings from these types of validation should form part of the HACCP study and its reviews.

If results show a level of contamination at the press but not the mixer, or vice versa, then the flush volume may need to be increased or alternative measures taken. Examples of these are reviewing addition points, reviewing and extending clearance timers, reviewing plant for wear, changing routes or scheduling rules to put sufficient clearance between the products at risk from the contaminant to ensure that product produced is within safe and legal limits.

Trend analysis of carryover results may be useful in identifying changes in plant performance before legal or feed safety limits are breached.

For each change or set of changes subsequent validations as described above should be completed to confirm the effectiveness of all actions undertaken.

Definitions:

| | |
|---|---|
| Carryover | The level of transfer of a portion of one production batch to the immediate subsequent batch. |
| Cross Contamination | The unintentional introduction of a feed or additive into another at unacceptable levels. |
| Coefficient of Variation (CV) | A statistical measure which gives an indication of the degree of variation in levels across the batch, calculated using the formula: CV= (SD/Mean)*100 |
| Limit of detection (LOD) | the smallest concentration of analyte that can reliably be detected by the method. |

| | |
|---|---|
| Limit of quantification (LOQ) | the smallest concentration of analyte that can reliably be quantified by the instrumental method. |
| Specified Feed Additive (SFA) | Feed additives with the following functions:<br>a. coccidiostats,<br>b. histomonostats, and<br>c. all other zootechnical additives except:<br>i. digestibility enhancers,<br>ii. gut flora stabilisers, and<br>iii. substances incorporated with the intention of favourably affecting the environment |
| Validation | Obtaining evidence that the elements of the HACCP plan are effective. (Codex) |
| Verification | The application of methods, procedures, tests and other evaluations, in addition to monitoring to determine compliance with the HACCP plan. |
| Veterinary Medicinal Product (VMP) | a. any substance or combination of substances presented as having properties for treating or preventing disease in animals; or<br>b. any substance or combination of substances that may be used in, or administered to, animals with a view either to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis |

# 7. Microbiological Monitoring

## 7.1 Salmonella

The Salmonella sampling and testing schedule must take into account the current Defra Code of Practice for the control of Salmonella in accordance with the Participant's risk assessment.

## 7.2. Enterobacteriaceae (Enteros):

These are a group of bacteria often used in poultry feed microbiology as indicator organisms to validate and verify, where required, the effectiveness of heat treatment or acid treatment as a kill step.

The presence in processed poultry feed may indicate inadequate treatment or post process contamination from the environment.

Entero testing may be used to monitor plant environmental hygiene downstream of heat treatment.

# 8. Evaluation of Test Results

There must be a regular formal, timely and documented review of all appropriate quality data which should include notes of any changes made, or corrective and preventative actions taken.

Covering, but not limited to:

- To maintain feed ingredient matrices
- To review nutritional test data of feeds
- To review and demonstrate action taken where results that are found to be outside legal limits
- To ensure effective and safe plant operation, from validation and verification testing
- To maintain microbiological integrity and standards
- To maintain physical quality within set parameters

## Appendix 1 Example Analyses for Feed Ingredient Testing

Key: X – Minimum testing, A – Additional tests. Where X or A not indicated – individual company assessment required

| Ingredient / Analyte / Type of Test | Cereal grains | Cereal by-products | Oil seeds/ fruits & their By-products | Legumes & by-products | Tubers, roots & by-products | Other seeds & fruits & by-products | Molasses | Milk products & by-products | Fishmeal | Food by-products | Fats & oils | Minerals | Min/ Vit premixes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dry Matter | X | X | X | X | A | A | X | | | X | X | | |
| Protein | X | X | X | X | A | A | X | X | X | X | | | |
| Oil A/B | A | A | X | A | A | A | | X | X | X | | | |
| Crude Fibre | A | X | X | X | X | X | | | | X | | | |
| Ash | A | A | A | A | X | A | A | | X | X | | | |
| Vitamin A | | | | | | | | | | | | | A |
| Vitamin E | | | | | | | | | | | | | A |
| Minerals trace elements | | | | | | | A | | | | | X | A |
| Salt/ sodium | | | | | | | | A | X | X | | | A |
| Fat quality | | | | | | | | | | | X | | |
| Undesirables | As per AIC Feed Safety Analysis Calculator. Numbers adjusted for Due diligence purposes only. | | | | | | | | | | | | |

## Appendix 2 Example analyses for Finished Feeds Testing

| Nutritional | Cattle | Sheep | Pig | Layers | Growing poultry | Controlled products |
|---|---|---|---|---|---|---|
| Moisture | X | X | X | X | X | |
| Protein | X | X | X | X | X | |
| Oil A/B | X | X | X | X | X | |
| Crude Fibre/ NDF | X | X | X | X | X | |
| Ash | X | X | X | X | X | |
| Other declared nutrients | X | X | X | X | X | |
| Salmonella | A | A | A | X | X | |
| Enterobacteriaceae | | | | A | A | |
| Mixer efficiency | As per UFAS Standard | As per UFAS Standard | As per UFAS Standard | As per UFAS Standard | As per UFAS Standard | X |
| Carry-over/ cross-contamination | | A | | | | X |
| Routine medicine/ SFA analyses | | | | | | As per VMD |
| Contaminant (med/ SFA) | | | | | | X |
| Copper | | X | | | | |

Agricultural Industries Confederation Limited
First Floor, Unit 4 The Forum,
Minerva Business Park, Lynch Wood,
Peterborough, PE2 6FT.
Telephone: 01733 385230

E-mail: **enquiries@agindustries.org.uk**
**www.agindustries.org.uk**