ICCF Glossary
Glossary of terms
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GLOSSARY OF TERMS

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The International Cooperation for Convergence of Technical Requirements for the Assessment of Feed Ingredients (ICCF) was launched in 2017 and aims to develop and establish common guidance documents to provide technical recommendations for the assessment of feed ingredients, including new uses of existing feed ingredients.

The founding members of the ICCF include the Canadian Food Inspection Agency (CFIA), the European Commission (DG SANTE), the U.S. Food and Drug Administration (FDA), as well as the American Feed Industry Association (AFIA), the Animal Nutrition Association of Canada (ANAC), the EU Association of Specialty Feed Ingredients and their Mixtures (FEFANA) and the International Feed Industry Federation (IFIF).

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ICCF GLOSSARY

Absorption[1]**:** The process(es) of uptake of a substance(s) into or across tissues after oral uptake of a feed ingredient. Absorption refers to all constituent entity(ies) of the feed ingredient.

Accepted reference value: A value that serves as an agreed-upon reference for comparison, and which is derived as:

- a theoretical or established value based on scientific references,
- an assigned or certified value, based on experimental work of some national or international organizations,
- a consensus or certified value, based on collaborative experimental work under the auspices of a scientific or engineering group,
- a validated and homogenous dilution of a known amount of the analyte in a matrix,
- when the above bullet points are not available, the expectation of the (measurable) quantity, i.e., the mean of a specified population of measurements.

Acceptable Daily Intake (ADI): An estimate of the amount of a substance in food that can be consumed daily over a lifetime without presenting an appreciable risk to human health.

Accuracy: The closeness of agreement between a test result and the accepted reference value.

Active substance: Any constituent entity or microorganism in a feed ingredient that contributes to its effectiveness.

Analyte: The constituent entity(ies) or microbial agent(s) present in the feed ingredient or their potential metabolites measured in tissues, target organs, blood/plasma, urine, faeces, manure or other relevant matrix(ces) with the proposed analytical method.

Analytical Procedure: The way of performing the analysis. It describes in detail the steps, equipment, and consumables necessary to perform each analytical test.

[1] Adapted from the OECD guidelines 417 (Toxicokinetics)

Aneugenicity[2]: the ability to cause a numerical deviation of the modal number of chromosomes in a cell or organism, other than an extra or reduced number of complete sets of chromosomes.

Aneuploidy[3]: Numerical deviation of the modal number of chromosomes in a cell or organism, other than an extra or reduced number of complete sets of chromosomes.

Assessment Factor (AF): A number used to divide the effect concentration to account for uncertainties related to intra- and inter-laboratory variation in toxicity data, intra- and interspecies variation, extrapolation from laboratory study results to the field.

Batch: An identified quantity of a feed ingredient or intended matrix having uniform characteristics, with specified limits and being produced from the same cycle of manufacturing production.

Benchmark dose: The estimated dose, based on all available toxicological data, produces a low predetermined change in the response rate of an adverse effect in the target organ/tissue. This predetermined change in response is called the benchmark response.

Bias[4]**:** The difference between the expectation of the test result and an accepted reference value.

Bias of the measurement method: The difference between the expectation of test results obtained from all laboratories using that method and an accepted reference value.

Bioaccumulation[5]**:** The increase of the amount of the constituent entity(ies) of the feed ingredient within tissues over time, following repeated exposure.

Bioavailability[6]**:** The fraction of an administered dose/level of the constituent entity(ies) of a feed ingredient that reaches the systemic circulation or is made available at the site of physiological activity, after ingestion of the feed ingredient.

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[2] Adapted from VICH GL 23 (R)

[3] Adapted from VICH GL 23 (R)

[4] Bias is the total systematic error as contrasted to a random error. There may be one or more systematic error components contributing to the bias. A larger systematic difference from the accepted reference value is reflected by a larger bias value.

[5] Adapted from the OECD guidelines 417 (Toxicokinetics)

[6] Adapted from the OECD guidelines 417 (Toxicokinetics)

Biomass: The result of a fermentative process. It may include the total product of the fermentative step or the by-product of fermentative steps, where the active substance has been removed for further steps or for the production of the ingredient market formulation(s).

Carrier: A feed ingredient or water used to physically facilitate handling of the feed ingredient under assessment and its incorporation into ingredient market formulations, premixtures, feeds or water. The use of a carrier does not alter the feed ingredient's intended effect and purpose.

Class of animals: The type of animals, based on livestock production system (e.g. piglet, sow, broiler chicken).

Constituent entity: Any chemical moiety present in the feed ingredient, including active substance(s).

Consumer: The person who ingests edible products derived from animals that were fed the feed ingredient.

Contaminant[7]: Any substance not intentionally added to feed, which is present in such feed as a result of the production, manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such feed, or as a result of environmental contamination.

Chromosome aberration[8]: any structural or numerical change of chromosomes.

Clastogenicity[9]: the ability to cause structural changes of chromosomes.

Coefficient of determination (R^2): The ratio of the standard deviation to the mean (or its absolute value), often expressed as a percentage:

$$Coefficient\ of\ determination\ (R^2) = \frac{Sum\ of\ squared\ residuals}{Total\ sum\ of\ squares}$$

[7] Adapted from the CODEX Alimentarius General Standard for contaminants and toxins in food and feed (CXS 193-1995), considering CAC/GL 80-2013. This definition covers the impurities linked to the process or carried over from the materials. This term does not include insect fragments, rodent hairs and other extraneous matter.

[8] Adapted from VICH GL 23 (R)

[9] Adapted from VICH GL 23 (R)

Coefficient of variation (CV): A measurement of relative variability. It expresses the standard deviation as a percentage of the mean. It is calculated using the formula:

$$\boldsymbol{CV}(\%) = \frac{\boldsymbol{SD}}{\boldsymbol{\bar{X}}} \times \mathbf{100}$$

Where:

- SD = standard deviation,
- $\bar{X}$ = mean.

Contaminant[10]: Any substance not intentionally added to feed, which is present in such feed as a result of the production, manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such feed, or as a result of environmental contamination.

Constituent entity: Any chemical moiety present in the feed ingredient, including active substance(s).

Consumer: The person who ingests edible products, derived from animals consuming the feed ingredient.

Correlation coefficient (r): A numerical measure of some statistical relationship between two variables.

$$Correlation\ coefficient\ (r) = \frac{\sum(X - mean_{\mathrm{x}}) \times (Y - mean_{\mathrm{y}})}{SD_{\mathrm{X}} \times SD_{\mathrm{y}}}$$

Degradation Time (DT): The time in which the initial concentration of the constituent entity tested is degraded by a given percentage (DT_{50} = 50% degradation; DT_{90} = 90% degradation)

Edible products[11]: The tissues and products of animal origin that is consumed by a consumer or enter the food chain and include, but are not limited to, muscle, liver, kidney, subcutaneous fat and skin in natural proportion, fat, whole eggs, whole milk, and honey.

[10] Adapted from the CODEX Alimentarius General Standard for contaminants and toxins in food and feed (CXS 193-1995), considering CAC/GL 80-2013. This definition covers the impurities linked to the process or carried over from the materials. This term does not include insect fragments, rodent hairs, and other extraneous matter.

[11] Adapted from Guidance for Industry #205: Studies to Evaluate the Metabolism and Residue Kinetics of Veterinary Drugs in Food-producing Animals, Metabolism Study to Determine the Quantity and Identify the Nature of Residues (MRK)

Effective Concentration (EC): The concentration of the constituent entity causing an effect on the studied population. It is usually followed by a number corresponding to the percentage of the population affected (e.g., EC_{10} is the concentration causing an effect on 10% of the population).

Endpoint: The impact of the feed ingredient, in relation to the intended effect, measured through defined parameters.

Environmental compartment: A spatially distinct and homogeneous part of the physical environment, for instance soil, water, or air.

Estimated bias: The determination of the measurement bias based on the experimental design.

Estimated LOD_{50}: The determination of the LOD_{50} (level of detection at 50% probability of detection) based on the experimental design.

***Ex vivo* effectiveness study:** The study performed by using tissues in an artificial environment outside the organism with the minimum alteration of natural conditions.

Feed (Feedingstuff)[12]: any single or multiple materials, whether processed, semi-processed or raw, which is intended to be fed directly to animals.

Feed Ingredient[13]: a component part or constituent of any combination or mixture making up a feed, whether or not, it has nutritional value in the animal's diet. Ingredients are of plant, animal, microbial or aquatic origin, or other organic or inorganic substances.

Feed supplement: A feed used with another feed to improve the nutritive balance or performance of the total ration and intended to be:

- Fed undiluted as a supplement to other feeds; or
- Offered free choice with other parts of the ration separately available; or
- Further diluted and mixed to produce the total ration.

Gene mutation[14]: A detectable permanent change within a single gene or its regulating sequences. The change may be a point mutation, insertion, deletion, etc.

[12] Adapted from Codex Alimentarius, Code of Practice on good animal feeding (CAC/RCP 54-2004)
[13] Adapted from Codex Alimentarius, Code of Practice on good animal feeding (CAC/RCP 54-2004)
[14] Adapted from VICH GL 23 (R)

Genotoxicity[15]: a broad term that refers to any deleterious change in the genetic material regardless of the mechanism by which the change is induced.

Half-life ($t_{0.5}$): The time taken for 50% reduction of a constituent entity when the reduction can be described by first-order kinetics; it is independent of the concentration and describes a particular case of the degradation time (DT_{50}).

Hazard Analysis and Critical Control Points (HACCP) Programme[16]**:** A system which identifies, evaluates, and controls hazards which are significant for feed safety.

Homogeneity: The ability of a feed ingredient to be distributed uniformly throughout an intended matrix.

Homogeneity testing: The assessment of the uniform distribution of a feed ingredient in an intended matrix.

***In silico* effectiveness models:** Computer models developed to evaluate the intended effect of the feed ingredient.

***In vitro* effectiveness study:** The study performed in a laboratory without recourse to intact animals to support or to demonstrate the feed ingredient's intended effect.

***In vivo* effectiveness study:** The study performed using intact animals, including the target species, to support or to demonstrate the feed ingredient's intended effect in the target animal species.

***In silico* models:** Computer models developed to predict the ADME properties of constituent entity(ies) of feed ingredients.

***In vitro* studies:** The studies performed with microorganisms, cells, or biological molecules outside their normal biological context to evaluate the ADME properties of the constituent entity(ies) of a feed ingredient.

***In vivo* studies:** The studies performed with whole living organisms (e.g. animals) that evaluate the ADME properties of the constituent entity(ies) of a feed ingredient.

[15] Adapted from VICH GL 23 (R)

[16] Adapted from Code of Practice on good animal feeding (CAC/RCP 54-2004).

Independent laboratory: A laboratory that has not been involved in the development and validation of the method of analysis.

Independent test results[17]**:** The results obtained in a manner not influenced by a previous result on the same or similar test object.

Ingredient market formulation: The commercial form containing the feed ingredient under assessment with carrier(s) and/or other feed ingredient(s) used to its incorporation into premix, feeds or water.

Intended matrix: A matrix in which the feed ingredient is added and is used to supply the feed ingredient to the animals. It may include the ingredient market formulation, premixture, feed, feed supplement, and water.

Inter-laboratory collaborative study: A study involving multiple independent laboratories, with the objective of assessing the performance and transferability of the methods of analysis.

Intermediate Precision: The closeness of agreement between a series of measurements obtained from multiple sampling of the same homogeneous sample under the prescribed conditions. Intermediate precision expresses within laboratories variations: different days, different analysts, different equipment, etc.

Internal Standard: A substance that behaves similar to the analyte and is added in a constant amount to the samples, the standards and/or the blank to facilitate the quantification of the analyte.

Laboratory animals[18]**:** The animals reared on controlled environmental conditions and used for testing the feed ingredient or its constituent entity(ies).

Laboratory sample: A sample prepared for sending to the laboratory and intended for inspection or testing.

[17] Repeatability and reproducibility conditions are particular sets of extreme conditions.
[18] Adapted from AVMA, 2021; 258 (3)

Limit of Detection (LOD): The characteristic applied to limit tests. The lowest concentration of analyte in a sample that can be detected but not necessarily quantified under the stated conditions of the test. It may be evaluated using the applicable equations, specific to the proposed analytical method. The detection limit is usually expressed as the concentration of the analyte in the matrix.

Limit of Quantification (LOQ): The characteristic of quantitative assays for low levels of analytes in sample matrices. It refers to the lowest concentration of analyte in a sample that can be determined by the method with acceptable precision and accuracy. It may be evaluated using the applicable equations, specific of the proposed analytical method. The quantification limit is usually expressed as the concentration of the analyte in the matrix.

Linearity: The ability of a method of analysis to generate results that are directly, or by well-defined mathematical transformation proportional to the concentration of analyte in samples, across the method's working range.

Lowest Observed Adverse Effect Level (LOAEL): The lowest tested level/concentration of a substance that causes an adverse effect in an exposed group compared to a (vehicle) control group, unless properly justified.

Manure: The excreta (urine and/or faeces) of animals, either mixed with organic matter (e.g., straw) or as is, as produced under normal conditions. It may be in liquid form (slurry) or in solid form (dung).

Materials[19]: (Raw) Materials and inputs used for the manufacturing process of the feed ingredients.

Matrix: All the components in a particular sample other than the analyte of interest.

Measurand: The quantity of the analyte to be measured.

Measurement bias: The estimation of systematic measurement errors, or the systematic difference between the quantitative assigned value and the average of measurement replicate results.

[19] Note that processing aids are not considered as materials

Measurement of Uncertainty: A parameter associated with the result of a measurement that characterizes the dispersion of values that could reasonably be attributed to the measurand.

Median Lethal Concentration (LC_{50}): The concentration of a constituent entity which results in 50% mortality of the study population.

Metabolism: The chemical conversion of the constituent entity(ies) of a feed ingredient into (a) different chemical substance(s) within the body. The conversion usually involves endogenous enzymes.

Metabolic pathways: The reaction chains, where chemical products become substrates for the next step in the chain.

Metabolites[20]: The products of metabolism or metabolic processes.

Method applicability: The usefulness of a method for analyzing a particular analyte in a defined matrix.

Method validation: The process used to confirm that the analytical procedure employed for a specific analysis is suitable for its intended use.

Method transferability: The process used to evaluate whether an independent laboratory is capable of performing the single laboratory validated analytical method reliably, accurately, and precisely for its intended use.

Method verification: The process used to evaluate the applicability of an official method or a standardized method, or the evaluation of the ability of an independent laboratory to apply the official method or standardized method proposed.

Method suitability: The capacity of a validated method of analysis to reliably achieve its intended purpose.

Micronucleus[21]: particle in a cell that contains microscopically detectable nuclear DNA; it might contain a whole chromosome or a broken centric or acentric part of chromosome. The size of a micronucleus is usually defined as less than 1/5 but more than 1/20 of the main nucleus.

[20] Adapted from the OECD guidelines 417 (Toxicokinetics)
[21] Adapted from VICH GL 23 (R)

Mineralisation: The breakdown of a chemical substance or organic matter in the presence of oxygen to carbon dioxide, water, and mineral salts of any other elements present.

No Observed Adverse Effect Level (NOAEL) [22]**:** The highest level/concentration of exposure to a substance, at which no adverse effects are observed in an exposed group, when compared to a vehicle exposed control group.

No Observed Effect Level[23] **(NOEL):** The highest level/concentration of a substance, found by experiment or observation, that causes no alteration of morphology, functional capacity, growth, development, or lifespan of the target organism distinguishable from those observed in normal (control) organisms of the same species and strain under the same defined conditions of exposure.

No Observed Effect Concentration (NOEC): The highest concentration tested having no statistically significant effect on the study population.

Non-target strain: The strain defined according to the scope of the reference method that would not reasonably be expected to be confirmed, detected, or enumerated by the proposed method.

Official method: A method of analysis either evaluated or adopted by a jurisdiction.

Point of departure (POD) [24] **:** The defined point on an experimental dose-response relationship for the adverse effect occurring at the lowest dose level. It may be the ratio of the no observed adverse effect level (NOAEL) to the lowest observed adverse effect level (LOAEL), but ideally it is established from benchmark dose modelling of the experimental data, and generally corresponds to a selected estimated low level of response (e.g. 1 to 10 % response for a quantal effect).

Precision[25]**:** The closeness of agreement between independent test results obtained under stipulated conditions. The measure of precision is usually expressed in terms of imprecision and computed as a standard deviation[26] of the test results.

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[22] WHO, EHC 240, 2009
[23] WHO, EHC 240, 2009
[24] Adapted from the definitions of EFSA, Guidance (2019) and US EPA risk assessment forum (2012)
[25] Precision depends only on the distribution of random errors and does not relate to the true value or the specified value.
[26] Less precision is reflected by a larger standard deviation.

Predicted Environmental Concentration (PEC): The estimation of the concentration of a constituent entity that reaches the relevant environmental compartment.

Predicted No Effect Concentration (PNEC): The estimation of the maximum concentration of a constituent entity that, when present in an environmental compartment, is not expected to cause adverse effects in non-target species.

Premix (Premixture): A uniform mixture of one or more feed ingredients with a carrier, not intended for direct feeding to animals. It is used to facilitate uniform dispersion of the feed ingredients in a larger mix.

Processing Aid[27]: Any substance or material, not including apparatus or utensils, and not consumed as a feed ingredient by itself, intentionally used in the processing of materials, feed or feed ingredient, to fulfil a certain technological purpose during treatment or processing and which may result in the non-intentional but unavoidable presence of residues or derivatives in the feed ingredient or its ingredient market formulation, provided that these residues and derivatives do not have an adverse effect on animal health, human health or the environment[28].

Purity: The concentration of the active substance in the feed ingredient.

Quantitative Structure Activity Relationship (QSAR)[29]: A mathematical model that can be used to predict the physical, chemical, biological properties, and environmental fate of compounds based on their chemical structure.

Radiolabeled: Labeled with one or more atoms replaced by a radionuclide.

Range: The interval between the upper and lower levels of analyte (including these levels) that has been demonstrated to be determined with a suitable level of precision, accuracy, and linearity using the method, as proposed. The range is usually expressed in the same units as the test results obtained by the analytical method.

[27] Adapted from the CODEX Alimentarius general Standard for the labeling of food additives when sold as such and from the definitions in the Regulation 1831/2003/EC on additives in animal nutrition.
[28] Note that some processing aids may also be used as functional feed ingredients.
[29] European Chemical Agency (ECHA), 2020

Read across[30]: A method where information about a chemical substance is inferred from a structurally or functionally similar reference compound with known data. This approach assists in predicting properties or behaviors when specific data for the target substance are limited or unavailable.

Recovery: The extraction efficiency of an analytical process, reported as a percentage of the known amount of an analyte carried through the sample extraction and processing steps of the method.

Reference standard: A well-characterized material related to the analyte with defined measurand (e.g., purity, known concentration), sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process.

Relative standard deviation (coefficient of variation) (RSD): A measure of deviation of a set of numbers disseminated around the mean expressed as %.

$$Relative\ Standard\ Deviation\ (\%) = \frac{Standard\ deviation \times 100}{Mean}$$

Repeatability: The precision under repeatability conditions.

Repeatability conditions: The conditions, where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time.

Repeatability limit: The value less than or equal to which the absolute difference between two test results obtained under repeatability conditions may be expected to be with a probability of 95 % or a pre-determined and justified acceptance criteria if this is not achievable.

Repeatability standard deviation: The standard deviation of test results obtained under repeatability conditions. It is a measure of the distribution of test results under repeatability conditions.

[30] European Chemical Agency (ECHA), 2020

Representative sample[31]**:** A sample in which the characteristics of the batch from which it is drawn are maintained. It is a simple random sample where each of the items or increments of the batch has been given the same probability of entering the sample.

Reproducibility: The precision under reproducibility conditions.

Reproducibility conditions: The conditions where test results are obtained using the same method on identical test items in different laboratories with different operators using different equipment.

Reproducibility limit: The value less than or equal to which the absolute difference between two test results obtained under reproducibility conditions may be expected to be with a probability of 95 % or a pre-determined value if this is not achievable.

Reproducibility standard deviation: The standard deviation of test results under reproducibility conditions. It is a measure of the dispersion of the distribution of test results under reproducibility conditions.

Ruggedness (Robustness): The measure of a method's capacity to remain unaffected by small but deliberate variations in procedural parameters.

Scope of laboratory application: The types of matrices, analytes, and concentration for an analytical method that a laboratory using the method claims to be capable of satisfactorily testing in its facility.

Scope of validation: The types of matrices, analytes, and concentrations included in a validation study.

Selectivity/Specificity: The ability of a method of analysis to assess unequivocally the analyte in the presence of components expected to be present in the feed ingredient or the matrix containing the feed ingredient, such as impurities, degradation products and other possible matrix interferences.

Sensitivity: The quotient of the change detected by the measuring system and the corresponding change in a value of a quantity being measured.

[31] Adapted from Codex Alimentarius, General Guidelines on Sampling (CAC/GL 50-2004)

Specification: The set of appropriate criteria to which a feed ingredient and material must conform to be considered acceptable for its intended use.

Standardized method: A method published by a standardization body based on multi-laboratory or collaborative validation studies (e.g., AOAC, ISO, CEN)

Study plan[32]: A document defining the objectives and experimental design for the conduct of the study, including any amendments.

System suitability: The determination of instrument performance (e.g., sensitivity, reproducibility, repeatability, chromatographic retention) by analyzing a set of reference standards before the analytical run.

Target organ: The organ or tissues evaluated in the context of animal safety studies.

Target species: The animal species or class(es) for which a feed ingredient is intended in the application.

Test article: The prototype of the feed ingredient specifically manufactured to test the feed ingredient.

Target strain: The strain, defined according to the scope of the reference method, that is expected to be confirmed, detected, or enumerated by the proposed method.

Test of significance: A formal procedure for comparing observed data with a hypothesis, the truth of which is being assessed.

Test portion: The measured (volume or mass) representative sample taken from the test sample for use in the preparation of the initial suspension.

Test result: The value of a characteristic obtained by carrying out a specified test method.

Test sample: A sample prepared from the laboratory sample according to the procedure specified in the test method and from which test portions are taken.

Tissue residue: The constituent entity(ies) of the feed ingredient or its (their) metabolite(s) present in edible products of the target species, to which the consumer may be exposed.

[32] OECD council decision amending annex III to the Council Decision concerning the mutual acceptance of data in the assessment of chemicals [C(81)30(FINAL)] 23/06/1998.

Tolerable Upper Intake Level (UL): The maximum level of total chronic intake of a nutrient from all sources to be unlikely to pose a risk of adverse health effects in humans.

Total manure: The excreta (urine and faeces) of animals, either mixed with organic matter (e.g. straw) or as is, as produced under practical conditions. It may be in liquid form (slurry) or in solid form (dung).

Trueness: The closeness of agreement between the average value obtained from a large series of test results and an accepted reference value. The measure of trueness is usually expressed in terms of bias.

Typing method confirmation: The method of analysis that confirms or types the same analyte as is confirmed or typed using the corresponding reference method.

User: The person handling the feed ingredient, either alone or in mixtures

Validation: The establishment of the performance characteristics of a method and provision of objective evidence that the performance requirements for a specified intended use are fulfilled.

Validation study: A study aiming at evaluating the performance characteristics of a method.

Variance: The expected value of the squared deviation from the mean of a random variable.

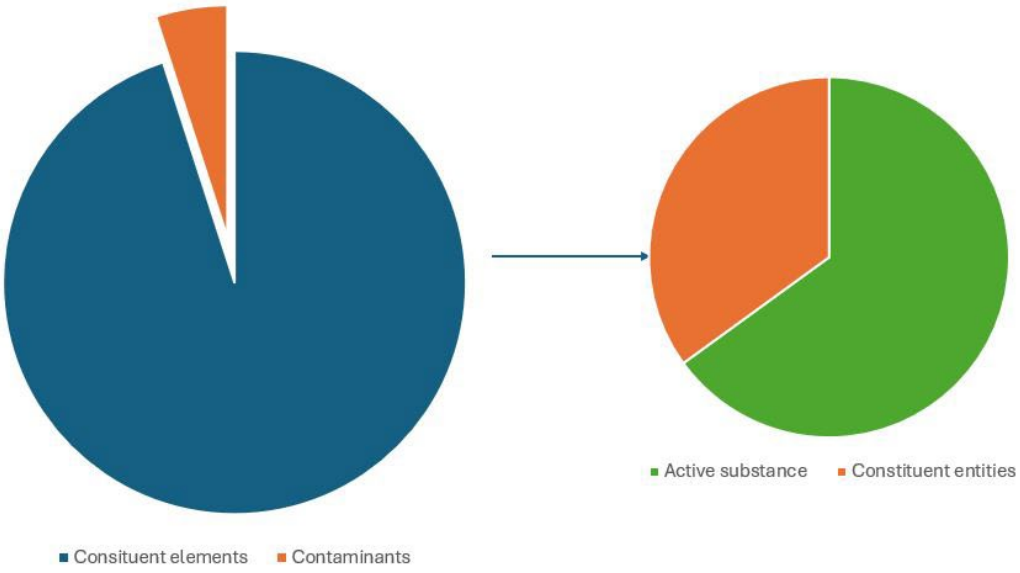
$$Variance = \frac{\sum(Value - Mean)^2}{Number\ of\ Values}$$

Weight of evidence assessment[33]**:** A process in which data from diverse sources is integrated to determine its relative support to answer a scientific question.

Working range: The interval between the upper and lower concentrations of analyte that yield suitable precision, accuracy, and linearity.

[33] Adapted from the EFSA Scientific Opinion on the guidance on the use of the weight of evidence approach in scientific assessments, 2017

Annex – Composition of feed ingredients[34]

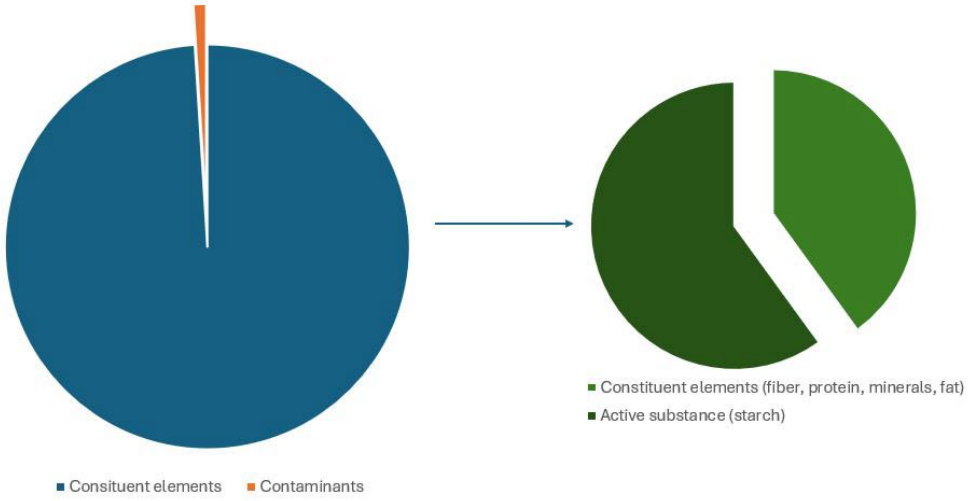


In the ICCF Guidance documents, a feed ingredient can be described based on two (2) main components:

- The constituent elements
  - The active substance, which is the substance providing the intended effect of the feed ingredient (the purpose of its use). there may be more than one active substance.
  - The other constituent entities and/or microbials, present in the feed ingredient, but not providing the intended effect.
- The contaminants, which are not deliberately present in the feed ingredient. Contaminants may be linked to the process used for the manufacturing of the feed ingredient or to environmental contamination (see Guidance Document on Manufacturing Process and Specifications)

[34] The graphs in this page and following ones are indicative and used to exemplify the concept

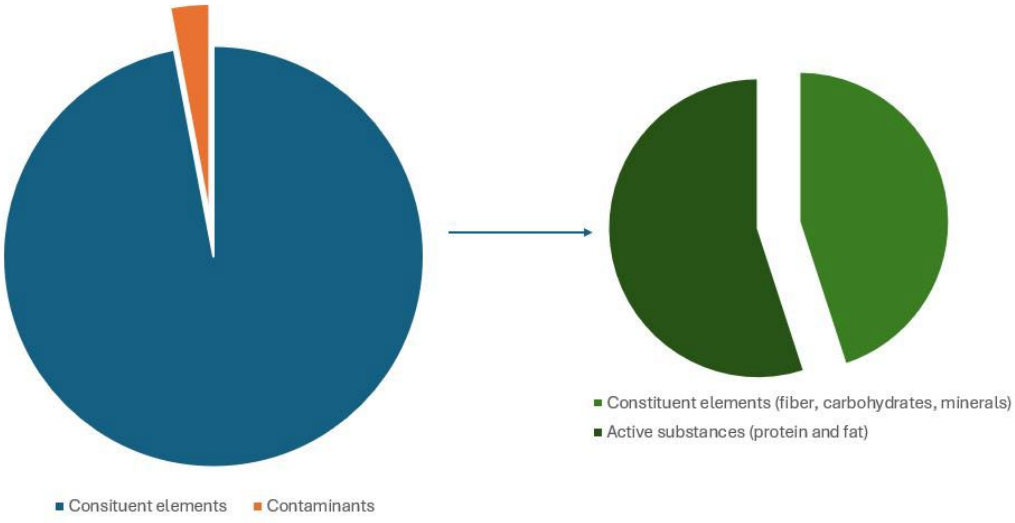
Agricultural Products



Agricultural products may be composed of the following elements:

- constituent elements:
    - The active substance (e.g., starch)
    - The other constituent entities (e.g., fiber, protein, minerals, fat)
- The contaminants, such as residues of treatments (e.g., biocidal product used) and environmental contaminants (e.g., dioxins, heavy metals)

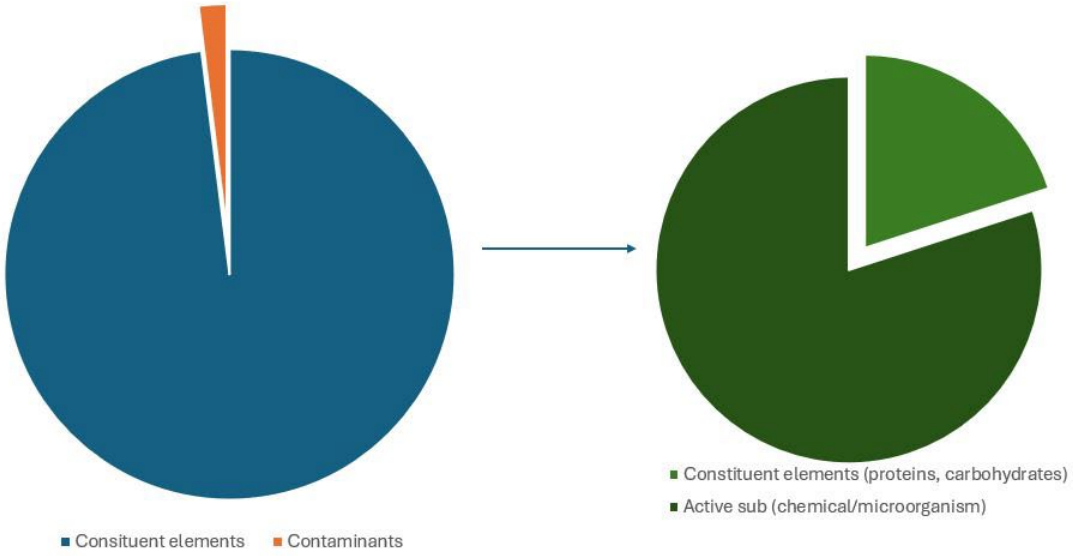
Co-products



Co-products may be composed of the following elements:

- constituent elements
    - The active substances (e.g., protein and fat)
    - The other constituent entities (e.g., fiber, carbohydrate, minerals)
- The following contaminants: chemicals used in the manufacturing process.

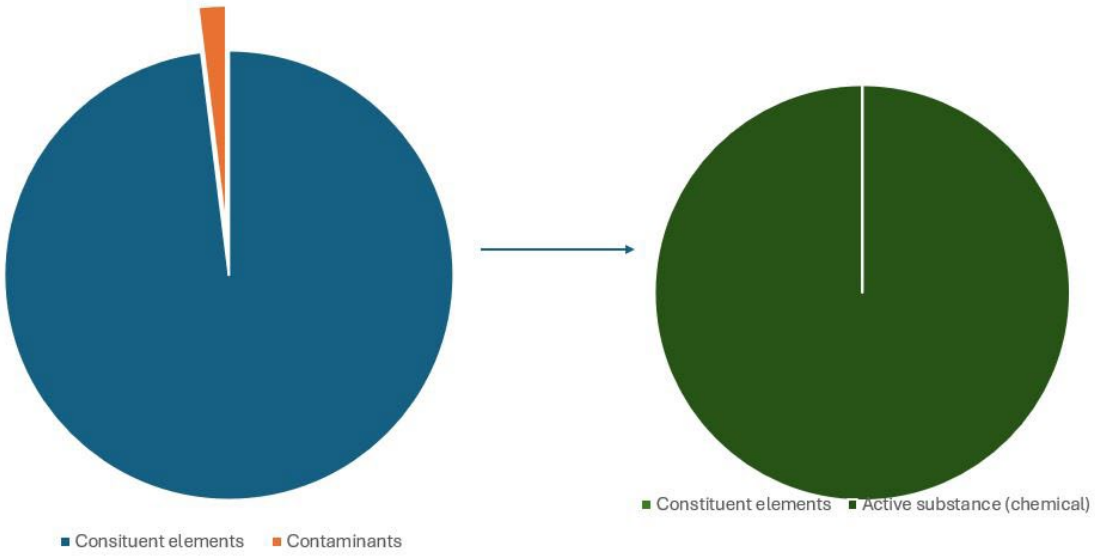
Ingredients produced by biological process



Ingredients produced by fermentation may be composed of the following element:

- constituent elements
    - The active substance (e.g., a chemical substance or a microorganism),
    - The other constituent entities (e.g., proteins, fat)
- The following contaminants (e.g., foaming agents used in the manufacturing process).

Ingredients produced by chemical synthesis



Ingredients produced by chemical synthesis may be composed of the following elements:

- The following constituent element
    - The active substance (e.g., a chemical substance)
- The following contaminants (e.g., chemicals used in the manufacturing process)