

9. ANALYSIS, CONTROLS AND EUROPEAN LEGISLATION

Detecting a halogenated organic compound in food does not automatically establish a legal infringement or quantify a health risk. The substances covered here belong to different chemical families: chlorinated paraffins, brominated flame retardants, chlorinated solvents and chloropropanols. Interpretation requires knowing which substance was sought, which method was used, in which food matrix, and against which scientific or legal reference point.

AN AGGREGATE PARAMETER CANNOT REPLACE TESTING FOR INDIVIDUAL SUBSTANCES

The abbreviation AOX, used mainly in environmental testing, refers to adsorbable organically bound halogens measured according to a defined procedure. It is an aggregate parameter: it does not identify the molecules contributing to the result and cannot, by itself, establish the presence of chlorinated paraffins, brominated flame retardants or particular solvents. Furthermore, AOX methods developed for water cannot automatically be applied to foods, which often contain fats, proteins or other interfering substances.

When food safety investigations concern an identified contaminant, targeted analyses are required: a 'low AOX' result does not establish the absence of every potentially relevant organohalogen substance.

HOW THE DIFFERENT FAMILIES ARE ANALYSED

Chlorinated paraffins (SCCPs, MCCPs and LCCPs) are complex mixtures of numerous congeners. Samples generally undergo extraction and clean-up before chromatographic and mass-spectrometric measurements. Differences in reference-standard composition, overlapping signals and instrumental responses can make results from different methods difficult to compare. EFSA has emphasised that there is no single method without limitations for comprehensively characterising these mixtures.

For various brominated flame retardants, including certain PBDEs, chromatography coupled with mass spectrometry is used; method selection depends on molecular structure. An analytical panel covering some PBDEs is not equivalent to testing for all brominated flame retardants, particularly emerging ones. For volatile chlorinated solvents such as trichloroethylene and tetrachloroethylene, sampling and preparation procedures must prevent losses; headspace techniques and gas chromatography may be used.

Different methods are needed for 3-MCPD and its esters, depending on whether free 3-MCPD, esterified forms or a sum expressed as 3-MCPD is quantified. Sample

preparation is especially important for oils and fatty products. Analytical methods must be validated for the matrices and concentrations concerned: theoretical instrumental sensitivity alone is not enough.

From measurement to result: what to consider



-  **Analytical method**
(suitable for the substance and the matrix)
-  **Limit of detection (LOD) and limit of quantification (LOQ)**
-  **Unit of measurement**
(e.g. $\mu\text{g/kg}$, mg/kg of fat)
-  **Measurement uncertainty**
-  **Comparison with regulatory or toxicological reference values**

LIMIT OF DETECTION, LIMIT OF QUANTIFICATION AND UNCERTAINTY

The limit of detection (LOD) is the level at which a signal can be distinguished from background noise using defined criteria. The limit of quantification (LOQ) is the level above which the laboratory can provide a numerical result with precision and accuracy appropriate to the purpose. 'Not quantified' does not necessarily mean 'absent': it may indicate a concentration below the method's LOQ.

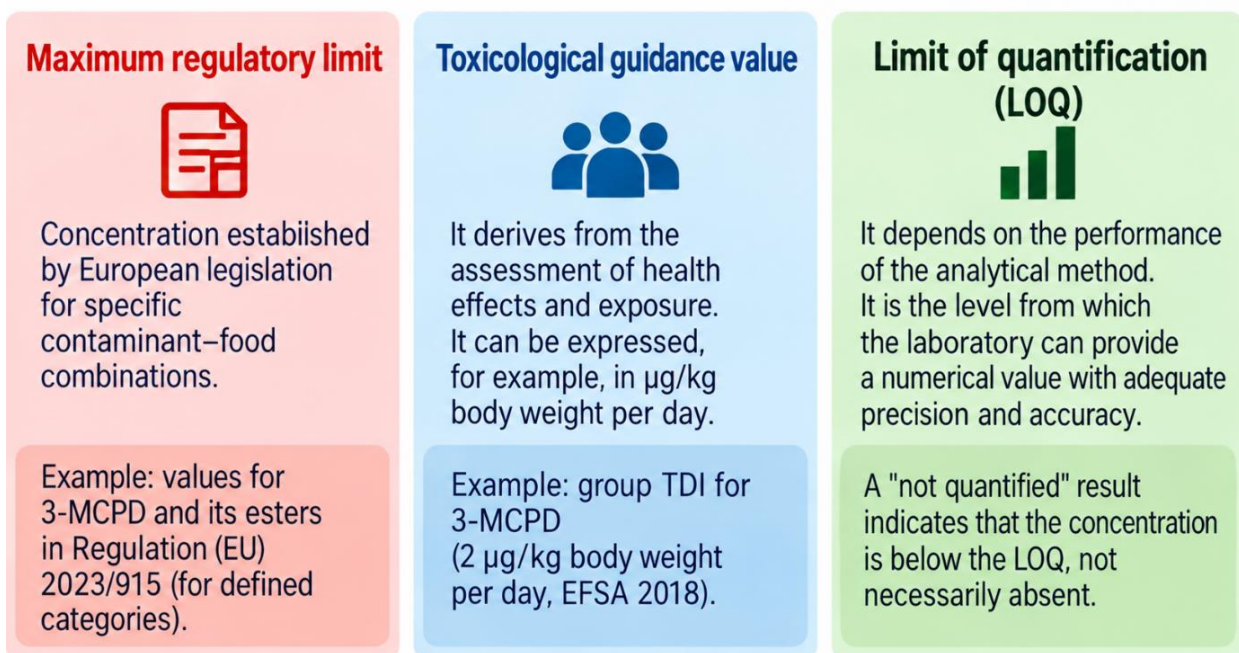
Comparing two tests requires consideration of units, food matrix, analytical method, LOQ, any recovery correction and measurement uncertainty. Scientific data for lipophilic contaminants are sometimes reported on a fat-weight basis while legal levels may refer to wet weight. These numbers are not interchangeable without correct conversion.

THREE DIFFERENT REFERENCE POINTS: LAW, TOXICOLOGY AND ANALYTICAL PERFORMANCE

A legal maximum level is a concentration established by legislation for particular combinations of contaminant and food. A toxicological guidance value, where available, comes from an assessment of health effects and exposure and may be expressed as intake per kilogram of body weight per day. The LOQ, by contrast, depends on the testing method. These three quantities must not be treated as equivalent thresholds.

Regulation (EU) 2023/915 sets maximum levels for certain food contaminants, including 3-MCPD and its esters in specified categories. It does not set one general food maximum for all halogenated organic compounds. For many chlorinated paraffins and brominated flame retardants, chemical-control legislation, monitoring obligations and scientific risk assessments must not be confused with maximum concentrations in individual foods.

Three references not to be confused



WHAT DOES EUROPEAN LEGISLATION REQUIRE?

Council Regulation (EEC) No 315/93 lays down general principles for contaminants in food, including keeping levels as low as reasonably achievable through good practices. Regulation (EU) 2023/915 establishes maximum levels for specified contaminants and food categories. Its consolidated text, annexes and transitional provisions must be checked before declaring non-compliance.

Regulation (EU) 2026/1825, which entered into force on 19 August 2026, amended Regulation 2023/915 concerning certain levels of 3-MCPD, its esters and glycidyl esters. For some affected categories, the provisions refer to 1 January 2027 for products previously lawfully placed on the market. This does not mean that every amendment or category has the same transitional arrangements. Glycidyl esters are included because the same regulation addresses them, but they are not halogenated organic compounds.

Regulation (EU) 2017/625 governs official controls throughout the agri-food chain. Sampling and analysis for 3-MCPD and other specified contaminants are subject to relevant technical provisions, including Regulation (EC) No 333/2007, as amended. Recommendation 2014/118/EU encouraged monitoring of brominated flame-retardant residues. A recommendation to monitor does not, on its own, establish binding maximum levels for every monitored compound.

Restrictions under REACH and persistent organic pollutant (POP) legislation may address production, use, placing on the market and material management, depending on the substance. Although such rules can help prevent contamination of food supply chains, they are not automatically equivalent to food-specific maximum levels. The legal classification and relevant annexes must be checked for each substance and at the relevant date.

HOW TO READ A LABORATORY TEST REPORT

A reliable report should identify at least the sample and matrix; substance or congeners tested; technique and method; result and units; LOQ and, where relevant, LOD; measurement uncertainty and method-validation information; and any legal reference used. For sums of congeners, it is important to understand which components are included and how results below analytical limits are handled.

Where a report states 'not detected', it is reasonable to ask what sensitivity was achieved. Where a substance is detected, the next step is to examine concentration and any applicable maximum level rather than immediately infer health risk. If no specific food maximum exists, assessment may require consumption data, toxicity, total exposure and comparison with evaluations by competent scientific bodies.

THE VALUE AND LIMITATIONS OF CONTROLS

Public controls and companies' own checks are essential preventive tools. Nevertheless, no analytical programme can seek every possible substance simultaneously at the same sensitivity. The selection of target contaminants depends on expected risk, the supply chain, geographical origin, previous evidence and

availability of suitable methods. For emerging contaminants, occurrence data may remain incomplete; EFSA's July 2026 update on brominated flame retardants highlighted gaps for numerous substances.

The practical conclusion is straightforward: a food that complies with applicable limits has met the legal criteria examined, but it has not necessarily been tested for every existing contaminant. Equally, a quantifiable trace does not automatically present a hazard to the person consuming that food. Useful information comes from combining appropriate analysis with the legal framework and scientific exposure assessment.

SCIENTIFIC AND REGULATORY REFERENCES

[EFSA CONTAM Panel \(2020\). Risk assessment of chlorinated paraffins in feed and food. EFSA Journal 18\(3\):5991.](#)

[EFSA CONTAM Panel \(2026\). Update of the risk assessment on emerging and novel brominated flame retardants in food. EFSA Journal 24\(7\):10187.](#)

[EFSA. Brominated flame retardants: scientific background and updates \(27 July 2026\).](#)

[Council of the European Communities. Regulation \(EEC\) No 315/93 laying down Community procedures for contaminants in food.](#)

[European Commission. Regulation \(EU\) 2023/915 on maximum levels for certain contaminants in food.](#)

[European Commission. Regulation \(EU\) 2026/1825 amending maximum levels for 3-MCPD, 3-MCPD esters and glycidyl esters.](#)

[European Parliament and Council. Regulation \(EU\) 2017/625 on official controls.](#)

[European Commission. Regulation \(EC\) No 333/2007 on sampling and methods of analysis for certain food contaminants.](#)

[European Commission. Recommendation 2014/118/EU on monitoring brominated flame retardants in food.](#)

[European Commission. Legislation on contaminants in food: general overview.](#)

[European Commission. Sampling and analysis of contaminants in food.](#)