

3. CHLORINATED PARAFFINS: LITTLE-KNOWN INDUSTRIAL CONTAMINANTS

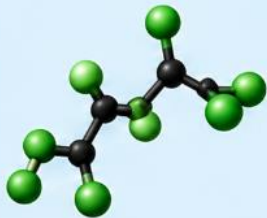
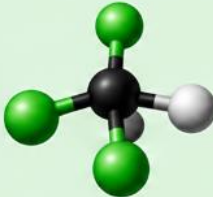
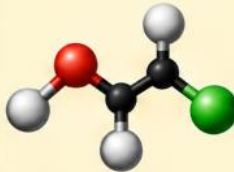
Chlorinated paraffins have been used in industrial processes for decades. Although unfamiliar to many consumers, some may disperse into the environment and enter food. Their presence does not automatically make food dangerous: risk assessment requires information on concentration, amounts consumed, exposure duration and the toxicological properties of the substances detected.

WHAT ARE THEY?

Chlorinated paraffins (CPs) are complex mixtures of alkanes in which some hydrogen atoms have been replaced by chlorine. They are therefore not one molecule but numerous substances differing in carbon-chain length, number of chlorine atoms and their positions. Commercial mixtures may contain very many congeners, and this diversity affects their physical properties, environmental behaviour and laboratory measurement.

Three conventional groups are distinguished: short-chain chlorinated paraffins (SCCPs), with 10–13 carbon atoms; medium-chain chlorinated paraffins (MCCPs), with 14–17; and long-chain chlorinated paraffins (LCCPs), with 18 or more. These abbreviations describe groups, not individual, precisely defined contaminants. The degree of chlorination is another important variable.

Img 1 – Main families of halogenated organic compounds

Chlorinated paraffins (SCCP, MCCP, LCCP)	Brominated flame retardants (PBDE, HBCDD, others)	Chlorinated solvents (trichloroethylene, tetrachloroethylene, others)	Chloropropanols (3-MCPD, 2-MCPD)
			
• Complex mixtures of many congeners • Persistent in the environment • They can accumulate in organisms	• Various congeners and chemical structures • Used in industrial products • They can be persistent and lipophilic	• Volatile • Industrial uses • Food contamination is often linked to specific situations	• They form during food processing • Present in free form or as esters • Studied mainly in refined oils and in some processed ingredients

WHY HAVE THEY BEEN USED?

Chlorinated paraffins have been used, among other applications, as additives in metalworking fluids, plastics, rubber, sealants, paints and coatings. In some formulations they help reduce flammability or improve material performance under mechanical stress. Applications vary by group and historical period; it would be incorrect to assume all these uses remain authorised today.

Releases may occur during production, use and waste management. Depending on the formulation, these substances may bind to particles, dust and sediments. Their behaviour depends on physicochemical characteristics that may vary substantially between components of a mixture.

PERSISTENCE, ENVIRONMENTAL DISTRIBUTION AND THE FOOD CHAIN

Some chlorinated paraffins are highly persistent and can accumulate in organisms. The strong affinity of many congeners for organic matter and lipids favours transfer to sediments and biological tissues, while mobility in air and water differs among substances. Bioaccumulation and possible biomagnification must be assessed for specific groups and congeners, rather than assuming a uniform behaviour for the entire family.

Aquatic organisms may be exposed through water, sediments and food. Terrestrial animals may also encounter contaminated soil, dust and feed. Observed concentrations in food reflect a combination of environmental sources, species characteristics, lipid content and production practices; they do not simply depend on whether a food is described as 'natural' or industrial.

WHAT HAS BEEN FOUND IN FOOD?

EFSA's 2020 assessment identified published occurrence data for SCCPs and MCCPs in various foods, but the analytical data formally available for quantitative exposure assessment were very limited. The preliminary assessment therefore relied mainly on 184 fish samples collected in Germany between 2014 and 2017. Reported mean levels in these samples were 7.5 micrograms per kilogram of wet weight for SCCPs and 13 micrograms per kilogram for MCCPs. These figures describe the samples studied, not average concentrations in fish marketed throughout the European Union.

Occurrence has also been reported in other food matrices, including animal products and oils, but geographical and methodological variation prevents simplistic generalisation. EFSA lacked sufficient food occurrence data to assess LCCPs. A scarcity of measurements is not evidence that a contaminant is absent.

WHAT IS KNOWN ABOUT HEALTH EFFECTS?

In toxicological studies reviewed by EFSA, the liver, kidneys and thyroid were target organs for certain SCCP and MCCP mixtures tested in laboratory animals. Interpretation for human health nevertheless requires caution: experimental mixtures may differ from those found in food, and uncertainties remain regarding toxicokinetics and various potential effects. The evidence for LCCPs was even more limited.

In 2020, EFSA could not fully characterise overall dietary risk, principally because occurrence data were insufficient across food categories. This neither establishes that every exposure is harmful nor rules out risk. The distinction between intrinsic hazard, actual exposure and risk remains crucial.

WHY ARE THEY DIFFICULT TO MEASURE?

Laboratories must investigate complex groups of congeners rather than a single substance, and their analytical signals partly overlap. Chromatographic and mass-spectrometric techniques can measure groups or profiles, but results and uncertainties depend on methods, calibration standards and mixture composition. Distinguishing SCCPs from MCCPs can also be challenging in complex matrices.

An analytical report should therefore specify which groups were sought, how summed results were defined, the limit of quantification and measurement uncertainty. A generic reference to ‘halogenated organics’, or an aggregate parameter such as AOX, neither identifies nor quantifies chlorinated paraffins: targeted analytical procedures are needed. Methodological issues are revisited in the chapter on controls.

ENVIRONMENTAL RESTRICTIONS AND REGULATION: AN EVOLVING FRAMEWORK

SCCPs were listed under the Stockholm Convention on Persistent Organic Pollutants in 2017 and are regulated in the European Union under Regulation (EU) 2019/1021, as amended. These provisions mainly concern substances, mixtures and articles and must not be confused with maximum contaminant levels established for food.

In May 2025, the Conference of the Parties to the Stockholm Convention decided to list MCCPs in Annex A, subject to specific exemptions and a technical definition that does not automatically encompass every commercial mixture labelled MCCP. On 11 September 2026, the European Commission adopted a delegated regulation intended to incorporate this listing into Annex I to Regulation (EU) 2019/1021. As at 16 October 2026, the act was still undergoing the scrutiny procedure applicable to delegated acts; it should not therefore be described as an amendment that had already definitively entered into force.

WHAT DOES THIS MEAN FOR CONSUMERS?

Chlorinated paraffins illustrate how substances used far from the food sector can become relevant to food safety. What is most useful to consumers is not a generic judgement about a chemical family, but knowledge of the compounds actually tested, the analytical results obtained and the strength of the exposure assessment. Better monitoring data are essential because an isolated measurement, without context, reveals little about actual risk.

SCIENTIFIC AND REGULATORY REFERENCES

- [1. EFSA CONTAM Panel \(2020\). Risk assessment of chlorinated paraffins in feed and food. EFSA Journal, 18\(3\), e05991.](#)
- [2. Regulation \(EU\) 2019/1021 on persistent organic pollutants \(text and amendments\).](#)
- [3. Stockholm Convention \(2025\). Decision SC-12/10 listing MCCPs in Annex A.](#)
- [4. European Commission \(2026\). Delegated act C\(2026\)6262, adopted on 11 September 2026 \(procedure ongoing as at 16 October 2026\).](#)
- [5. Optimization and validation of an analytical method for the quantification of short- and medium-chained chlorinated paraffins in food by gas chromatography-mass spectrometry. Food Control \(2020\).](#)