

1. BEYOND THE BEST-KNOWN CONTAMINANTS

When food contamination is discussed, attention often focuses on pesticides, PFAS, metals, dioxins or mycotoxins. These are important groups, but they do not encompass all the unwanted substances that may enter our diet. Some come from the environment; others form during processing or cooking, migrate from food-contact materials or are produced naturally by plants. Understanding their origins helps us identify which checks are relevant and what an analytical result can genuinely tell us.

WHAT IS MEANT BY A FOOD CONTAMINANT?

Under the European framework, a contaminant is generally a substance not intentionally added to food that may be present as a result of production, processing, packaging, transport, storage or environmental contamination. This definition describes how a substance enters food; it does not, in itself, establish its hazardous properties or the level of risk to consumers.

Not all unwanted substances fall under the same legal regime. Residues of plant protection products, residues of veterinary medicines and substances migrating from food-contact materials are also subject to specific legislation. Moreover, microbiological hazards, such as pathogenic bacteria and viruses, require approaches different from those used for chemical substances. This library focuses on chemical contaminants, referring to other areas where they help explain the journey of food through the supply chain.

FOUR MAIN ROUTES INTO FOOD

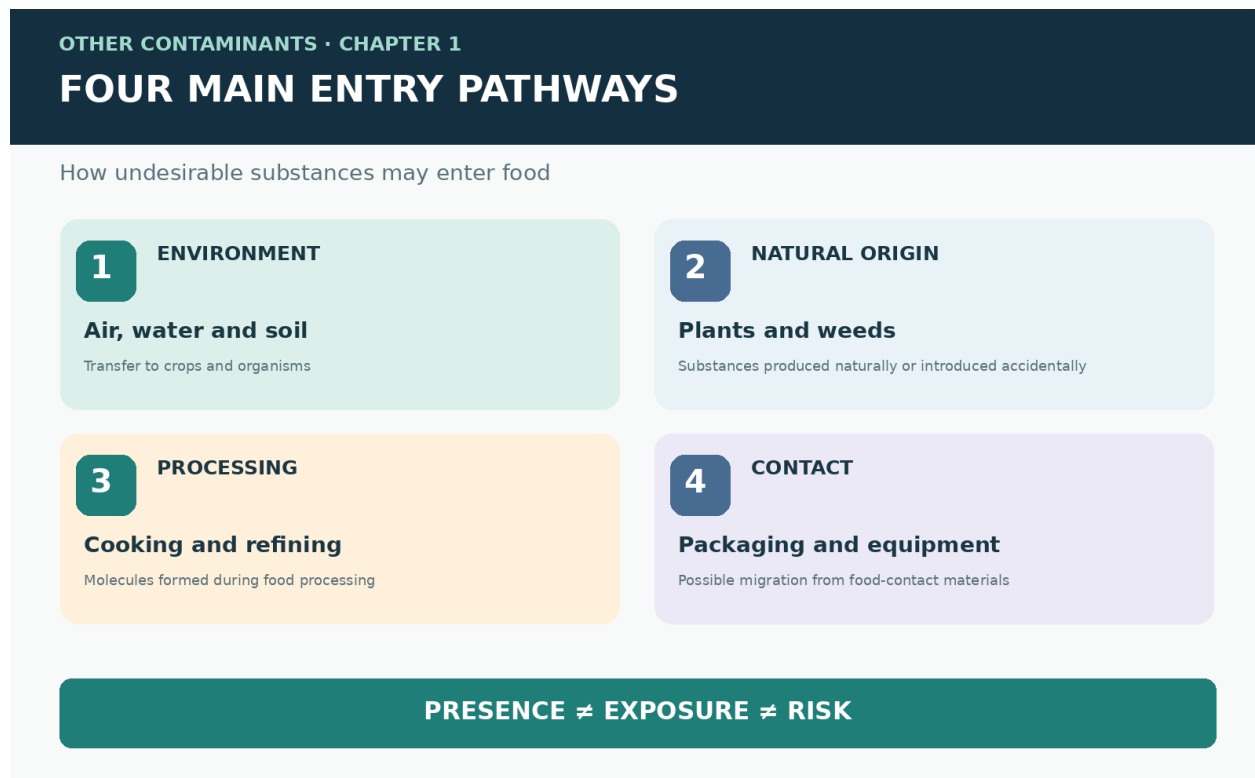
The first route is environmental: air, soil and water may contain substances of natural origin or associated with human activities. Their presence in the environment does not, however, mean they automatically transfer into food at the same concentration. Chemical form, bioavailability, crop species, the part consumed and local conditions all matter. Environmental investigations and analyses of food products therefore provide complementary information.

The second route is biological or natural. Some plants produce defensive substances that may be undesirable in the diet under particular conditions or at particular concentrations. Other substances enter harvested crops accidentally through weeds, as occurs with certain alkaloids. 'Natural' does not automatically mean harmless: the substance and the level of exposure must still be assessed.

The third route is technological. Acrylamide, for example, may form when certain starchy foods are cooked at high temperatures; unwanted compounds may also arise during oil refining. They are not necessarily present in the raw material in the same form or at the same concentration as in the finished product. Processing conditions are therefore an integral part of prevention.

The fourth route involves contact along the supply chain. Packaging, coatings, equipment and other materials can release substances into food, depending on the material, temperature, duration of contact and characteristics of the product. This

possibility is governed by specific provisions on food-contact materials and articles, commonly referred to in Italy as MOCA.



THE GROUPS COVERED IN THIS SECTION

In the following chapters we will examine nitrates, nitrites and nitrosamines; chlorates and perchlorates; acrylamide and other cooking-related contaminants; substances formed during oil refining; bisphenols, phthalates and migration from food-contact materials; microplastics and nanoplastics; veterinary medicine residues; emerging contaminants; and unwanted plant-derived alkaloids.

These subjects do not constitute a single chemical family. They are grouped together because they complete the picture of potential contamination pathways not already explored in other sections of Overorganic. It would be incorrect to attribute the same prevalence, toxicity or degree of scientific understanding to all of them.

PRESENCE, EXPOSURE AND RISK ARE NOT SYNONYMOUS

A laboratory can identify a substance in food and measure its concentration. Essential though this finding is, it does not by itself establish the risk to someone eating that food. Exposure also depends on the amount consumed, frequency of consumption, body weight and possible contributions from other foods or sources. For some substances, the susceptibility of particular groups, such as children or pregnant women, must also be considered.

Risk assessment relates this information to toxicological knowledge. Some compounds have health-based guidance values derived from exposure thresholds; others, particularly where specific genotoxic and carcinogenic mechanisms are involved, require different risk-management criteria. Consequently, there is no universal threshold that can indiscriminately divide all foods into 'good' and 'bad'.

WHAT DOES 'NOT DETECTED' MEAN?

A result below the limit of quantification (LOQ) means that the substance cannot be reliably quantified at the level specified for that particular method. It does not demonstrate absolute absence. The meaning of the laboratory report depends on the substance investigated, the food matrix, the method, the sampling procedure and the LOQ value.

The choice of which substances to investigate is equally important. A very broad analytical panel may provide more detailed knowledge, but no single test can rule out every possible contaminant. The testing strategy must be designed around the risks relevant to the food, its origin and the production supply chain.

THE ROLE OF EUROPEAN LEGISLATION AND OFFICIAL CONTROLS

The European Union regulates contaminants through general principles and specific legislation. Council Regulation (EEC) No 315/93 provides, among other things, that food must not be placed on the market if it contains contaminants in amounts unacceptable from a public-health perspective and that levels should be kept as low as can reasonably be achieved through good practices. Regulation (EU) 2023/915, as amended, sets maximum levels for certain substances and food categories.

However, not all the groups discussed in this section fall under the same regulation: veterinary residues, food-contact materials and acrylamide mitigation measures are also covered by sector-specific rules. Furthermore, a maximum level is a legal compliance criterion, not a guarantee that a substance is absent, nor a universal measure of nutritional or sensory quality.

EFSA scientifically assesses hazards and exposure; European and national institutions adopt risk-management measures, while competent authorities carry out official controls. This system is essential to food safety, but it continues to evolve as scientific knowledge, analytical methods and monitoring data improve.

WHY EXPLORE LESSER-KNOWN CONTAMINANTS?

A food may comply with the law while still being characterised more precisely through additional analytical information. Such investigation has value only if it is scientifically relevant and interpreted without alarmism: finding a trace does not necessarily mean identifying a significant health risk, just as not testing for a substance does not demonstrate its absence.

The purpose of this section is therefore to equip readers to ask better questions: where might a substance come from, in which foods is its presence plausible, which methods can measure it, which legal limits apply and what uncertainties remain? This is the difference between knowing a result and understanding what it means.

SCIENTIFIC AND REGULATORY REFERENCES

- EFSA (2026). Chemical contaminants in food and feed. [↗ Source](#)
- EFSA (2026). Chemicals in food. [↗ Source](#)
- European Commission. Contaminants – Food Safety. [↗ Source](#)
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- Council Regulation (EEC) No 315/93 – Community procedures for contaminants in food. [↗ Source](#)
- Commission Regulation (EU) 2023/915 – maximum levels for certain contaminants in food (updated text). [↗ Source](#)
- Regulation (EC) No 1935/2004 – materials and articles intended to come into contact with food. [↗ Source](#)
- Regulation (EU) 2024/3190 – provisions concerning bisphenols in food-contact materials, as subsequently amended. [↗ Source](#)