AGRINFO

GUIDANCE

MINERAL OIL HYDROCARBONS IN FOOD

AN INTRODUCTION TO UPCOMING EU REGULATION

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CONTENTS

KEY POINTS

Mineral oil hydrocarbons (MOH) are a complex mixture of chemical compounds derived from petroleum. During the production and processing of food, MOH can find their way into the food supply chain from the environment or during harvest, transport, or processing. MOH in food can accumulate in the body, and may damage DNA and cause cancer.

To reduce risks to EU consumers, in 2027 the European Union (EU) intends to introduce rules that will limit the presence of MOH in food. As the EU Regulation under discussion is among the first worldwide to address MOH, actors throughout the food chain, and competent authorities in non-EU countries, will need to keep informed.

The new rules will particularly require attention and possible action from certain sectors: **cereal products, rice, tree nuts, pulses, spices, dried herbs, cocoa/chocolate, milk and dairy products, oilseeds and oil fruits, animal/vegetable oils**. Suppliers in these sectors may currently have no or limited data on the presence of MOH in their products. To avoid future trade disruption, suppliers of these products are recommended to urgently:

- **undertake analysis** to identify any presence of MOH
- **assess potential sources** of contamination, and
- **develop strategies** to reduce any risk of contamination.

Once present in raw materials, MOH cannot be removed during food processing.

This Guide provides a simple introduction to MOH, their origins and effects, the regulatory intentions of the EU, the sectors most affected, and actions required to prepare for compliance with the new rules.

1. WHAT ARE MINERAL OIL HYDROCARBONS?

Mineral oil hydrocarbons (MOH) are chemical compounds derived from crude oil but also produced synthetically from coal, natural gas, and biomass. They occur in two forms:

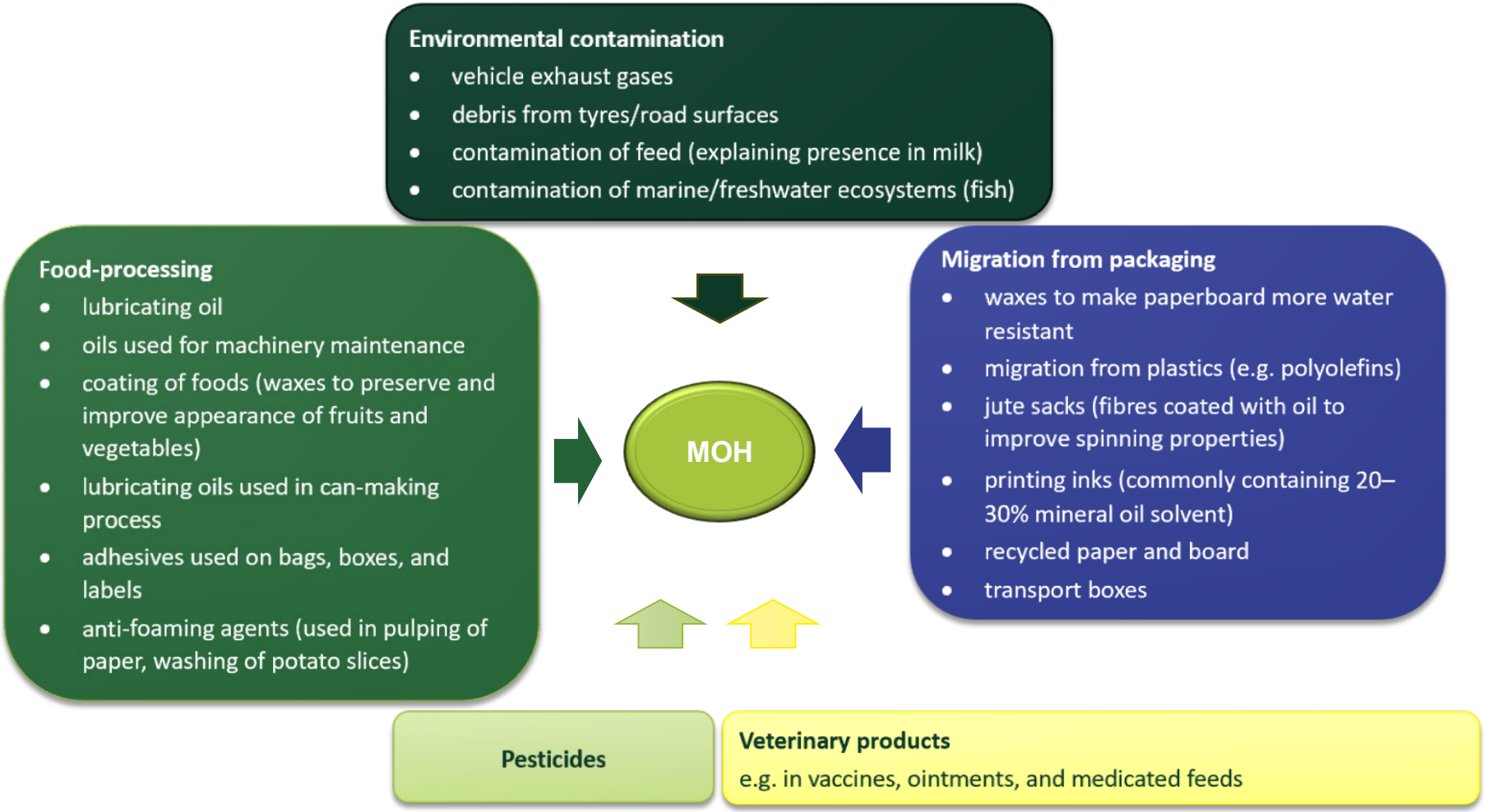
- mineral oil **aromatic** hydrocarbons (**MOAH**)
- mineral oil **saturated** hydrocarbons (**MOSH**).

MOH can enter food as a result of the way the food is handled throughout the supply chain, or from the environment. The most significant sources are:

- *Agricultural contamination:* fuel or lubricants can leak from farm machinery; pesticides may contain paraffin oils or mineral oils.
- *Environmental contamination*: exhaust gases from power plants, motor engines, and heating burners can come into direct contact with raw materials, or settle on the soil and be taken up by plants.
- *Packaging of raw materials*: when raw materials are transported prior to processing, they may come into contact with mineral oils. Jute sacks, in particular, are known to be a potential source of mineral oils, as mineral oils are used in their manufacturing.
- *Lubricants*: "food grade" lubricants that are intended for use in food processing machinery nevertheless contain mineral oils that come into contact with the food during processing.
- *Food additives*: certain waxes, emulsifiers, and technical aids for preventing flour dust or cheese coatings may contain mineral oils.
- *Packaging of foods*: mineral oils can be present in additives used in the production of food contact materials (adhesives, plastics, metal cans, paper and cardboard food contact materials). Mineral oils may also be present in recycled packaging materials. These cannot always be removed during recycling and may enter food when it comes into contact with the packaging.

Figure 1 summarises the potential sources of MOH contamination identified by the European Food Safety Authority (EFSA).

Figure 1: Potential sources of MOH contamination. Source: based on EFSA (2023)[1]



[1] EFSA (2023) Update of the risk assessment of mineral oil hydrocarbons in food. *EFSA Journal*, 21(9): 8215.

2. WHY REGULATE?

The primary focus of EU regulators is on mineral oil aromatic hydrocarbons (**MOAH**). These may contain genotoxic substances that can damage DNA in cells and cause cancer.[2] The basic aim is to eliminate MOAH from the food chain. This means they should be undetectable (lower than the limit of quantification, LOQ) in food that is supplied on the EU market.

Current exposure to mineral oil saturated hydrocarbons (**MOSH**) does not raise concerns for human health, but there is uncertainty about their long-term accumulation.[3] As increased levels of MOSH could potentially be a risk, levels in food should be kept low.

EU action on MOH in food is not new. Over time, the EU has gradually been stepping up initiatives to reduce risks associated with MOH (see Timeline below).

EU Action on MOH – Timeline

2012	EFSA concludes that some MOAH are considered mutagenic and carcinogenic, and more monitoring of foods is required.
2017	European Commission recommends that EU Member States and food businesses submit monitoring data to EFSA to establish a single database (Recommendation 2017/84).
October 2019	Foodwatch publishes a report showing a quantified presence of MOAH in 16 different baby milk products from different EU Member States.
June 2020	EU Member States approve a Joint Statement agreeing to take measures where MOAH exceed 1 mg/kg per MOH C-fraction in infant formula and follow-on formula (Statement of June 2020).
December 2021	Foodwatch publishes a report on mineral oils in a range of processed foods.
April and October 2022	EU Members States agree to take enforcement action (market withdrawals and, if necessary, market recalls) against concentrations of MOAH in all foods at levels above the agreed limits of quantification (Statement of April 2022 and clarifications of October 2022).
July 2023	EFSA publishes its updated risk assessment on MOH.
Last quarter 2023	EU Member States start work on establishing maximum levels based on EFSA risk assessment.

[2] EFSA (2023).
[3] EFSA (2023).

3. WHAT ARE THE CURRENT RULES?

Currently there are no maximum levels for MOH in EU legislation.

In relation to mineral oil aromatic hydrocarbons (MOAH), EU Member States agreed in April 2022[4] that when they check food products during official food controls, they will use the limits of quantification (LOQ) set out in Table 1 to determine whether action is needed.

Table 1: LOQs of MOAH according to fat/oil content of the food

Fat/oil content of food (%)	LOQ (mg/kg)
≤4	0.5
>4, ≤50	1
>50	2

Where the concentration of MOAH in food products exceeds the LOQs, competent authorities agree to to take further action, for example, to withdraw or recall products from the market. Food businesses are expected to undertake their own internal controls using the same LOQs.

For an overview of EU Member State notifications of findings of MOH levels in food, see Annex II.

4. HOW DOES THE EU INTEND TO REGULATE MOAH?

To reinforce its action, the EU now intends to establish legal maximum levels for MOAH in certain foods under Regulation 2023/915. Products exceeding the maximum levels cannot be imported or sold in the EU.

Note that as of June 2025, the maximum levels are still under discussion. The levels referred to below therefore only reflect the discussions of June 2025. While these provisional levels may change, they provide a clear indication to the sectors concerned of the EU's overall intentions.

The EU is considering the following approach whereby maximum levels will be set for some foods from the outset (section 4.1 below), while temporary maximum levels (4.2), higher levels (4.3), or no maximum levels (4.4) will be set for other foods depending on the degree of consumer risk and the analytical capacity for measuring MOAH levels.

[4] European Commission (2022) Summary Report of the Standing Committee on Plants, Animals, Food and Feed: Section Novel Food and Toxicological Safety of the Food Chain, 21 April.

4.1. Foods with maximum levels set at the LOQ from 1 January 2027 (provisional target date)

For the following foods, the EU intends to set maximum levels from 1 January 2027 at the LOQ according to the fat/oil content as set out in Table 1 (ranging from 0.5 to 2 mg/kg):

- oilseeds and oil fruits
- animal or vegetable fats/oils (but temporary maximum levels > LOQ until 2030 for some – see Table 2)
- tree nuts
- pulses
- cereal grains including rice and products derived from cereals
- milk and dairy products[5]
- cocoa beans,[6] cocoa mass, cocoa powder, cocoa and chocolate products and other confectionery
- infant formula/baby foods/cereal-based foods for infants and young children.

4.2. Animal or vegetable fats/oils (for certain products temporary maximum levels >LOQ until 2030)

For certain animal or vegetable fats, it has been demonstrated that the LOQs shown in Table 1 cannot be met. The maximum levels currently under discussion for this product sector are set out in Table 2.

Table 2: Maximum levels under discussion for animal and vegetable oils

Oil from:	**Maximum levels (mg/kg) from:**			
	1 Jan 2027	**1 Jan 2028**	**1 Jan 2029**	**1 Jan 2030**
Maize, rapeseed, sunflower, soybean, linseed	2.0			
Groundnut, sesame, coconut, cereal germ	6.0	4.0		2.0
Grapeseed, cottonseed, blackcurrant seed, argan	10.0	5.0		2.0
Olive pomace		10.0	5.0	2.0
Fishery products/algae	10.0			5.0
Other oils/fats not listed above	4.0	2.0		

[5] An exception is butter, for which the maximum level under discussion is 2 mg/kg *regardless of the fat content of the butter.*

[6] The maximum level applies to the edible part.

4.3. Foods with higher LOQs

For certain foods, there are known to be difficulties today in accurately analysing at the LOQs in Table 1. Higher maximum levels are therefore under discussion for the foods listed in Table 3.

Table 3: Maximum levels under discussion for products requiring higher LOQs

Product	Maximum levels (mg/kg) from:	
	1 Jan 2027	1 Jan 2030
Spices, dried herbs, tea and herbal infusions used as an ingredient in food, dry instant tea and dry instant herbal infusions	5.0	5.0
Food supplements	10.0	5.0

4.4. Foods with no maximum levels

No maximum levels are proposed for **fresh or frozen fruits, vegetables, meat, offal, fish and seafood, coffee and tea, and herbal infusions for making a brew,** as these are not considered to be significant sources of MOAH. For **processed foods (vegetables, fruits, eggs, meat, offal, fish and seafood) and essential oils** insufficient data is available to establish whether maximum levels are needed.

For some of the above products, indicative levels for MOAH (1.0–10.0 mg/kg) are under discussion.

Where indicative levels are exceeded, Member States and food business operators will be recommended to:

- sample and analyse the products
- investigate the source of contamination
- report on the outcome of investigations by operators.

These foods may generally still be imported into the EU.

EU Member States will be further monitoring foods for which no maximum levels are proposed, in particular **processed foods**, which typically have higher levels of contamination. The EU may set maximum levels for these foods in the future, if data collected indicates a need.

5. HOW ARE MAXIMUM LEVELS SET?

Maximum levels for all contaminants under EU law are set

> "*at a strict level, which is reasonably achievable by following good agricultural, fishery and manufacturing practices and taking into account the risk related to the consumption of the food. In the case of a possible health risk, maximum levels for contaminants should be set at a level which is as low as reasonably achievable (ALARA). Such an approach ensures that food business operators apply measures to prevent and reduce the contamination as much as possible in order to protect public health*." [Regulation (EU) 2023/915, introductory recital (2)]

In its 2023 evaluation, EFSA considered 6,120 samples with data on MOAH submitted by European countries and food associations, 90% of which were submitted after 2017 (when the European Commission recommended more extensive monitoring). More data has been submitted for some products than others (see Annex I).

6. ACTION ON MOSH

Regarding mineral oil saturated hydrocarbons (MOSH), the EU is not currently considering establishing maximum levels in law.

However, as there is concern that increased exposure to MOSH could lead to health concerns, there are discussions about recommending "indicative levels". These are levels that would require EU Member States and operators to investigate the source of contamination and assess the systems in place to avoid MOSH contamination. Products exceeding the indicative levels will generally not be removed from the market (unless they are considered by control authorities to be unsafe).

The indicative levels under discussion for MOSH are set out in Table 4.

Table 4: Indicative levels under discussion for MOSH

Product	Indicative level (mg/kg)
Olive/grapeseed/blackcurrant/cottonseed/cereal germ/essential oil and oil from fishery products/algae	50
Linseed/maize/rapeseed/sunflower/soybean oil	15
Other animal and vegetable oils	30
Spices, dried herbs, tea, herbal infusions, food supplements	15
Cocoa beans and cocoa products, sugar and sugar products, confectionery, processed meat, processed fish/seafood, processed eggs	10
Oilseeds/fruits, tree nuts, pulses, cereals, milk, coffee beans, eggs, baby foods, processed vegetables, processed fruits	5
Infant formula	1.0

7. WHAT ARE THE CHALLENGES FOR MANAGING MOH IN FOOD?

Suppliers in non-EU countries may face the following challenges in preparing for new EU rules.

7.1. Identifying sources of contamination

As there are many potential sources of contamination with MOH, identifying precise sources in specific food sectors is very challenging. Certain sources of mineral oils have been identified and reduced, such as the application of white mineral oils as a lubricant, and migration of mineral oils from paperboard packaging. However, certain forms of environmental contamination may be difficult to avoid. Identifying sources is crucial to developing strategies that will allow sectors to comply with new EU rules, but remains a challenge due to the complex and fragmented nature of the food supply chain and limited analytical capacity in many countries.[7]

7.2. Testing

Testing method

EFSA considers that there is a reliable method available for testing: the LC-GC-FID method (coupling liquid and gas chromatography with subsequent flame ionisation detection). In some foods, endogenous substances are available that can interfere with the LC-GC-FID analysis. Therefore for certain foods, certain sample preparation steps need to be carried out in order to remove these endogenous interferences. In some specific cases the interferences cannot be removed completely by the sample preparation steps. In those cases, if the level is exceeded, a confirmatory analysis should be carried out with two-dimensional gas chromatography (GCxGC), in order to distinguish the real MOH from the endogenous substances.

The European Commission's Joint Research Centre has developed guidance on sampling analysis and data reporting for monitoring MOAH.[8]

Availability of testing

Analytical capacity for evaluating MOH is more developed in the EU than in many non-EU countries. Businesses in non-EU countries may not have access to laboratories accredited for testing MOH nationally or regionally. They may therefore have to rely on shipping samples to the EU for analysis.

Testing costs

As the testing of MOH is not routine, the cost of mineral oil analysis (MOAH and MOSH) in the EU is currently around four to five times the cost of a comparable multiple pesticide analysis. With the introduction of specific legislation on MOH, this cost is expected to reduce significantly over time.

7.3. Other issues raised by stakeholders

In response to questions been raised by stakeholders in early 2024 about how the EU intends to regulate MOH, the European Commission has published an FAQ document on the draft regulatory measures on mineral oil hydrocarbons (MOHs) in food.

[7] Buijtenhuijs, D. and van de Ven, B.M. (2019) Mineral oils in food: a review of occurrence and sources. Dutch National Institute of Public Health.

[8] Bratinova, S., Robouch, P. and Hoekstra, E. (2023) Guidance on sampling, analysis and data reporting for the monitoring of mineral oil hydrocarbons in food and food contact materials (2nd edn). Luxembourg: Publications Office of the European Union.

8. HOW TO PREPARE FOR THE EU REGULATION?

MOAH contamination can occur at different steps in the supply chain. These can accumulate to give high levels that **cannot be removed during processing** once they are in the raw material. Vigilance and coordination will be needed all along the food chain. Non-EU suppliers of food, particularly the sectors for which maximum levels will be set (see section 4), must urgently take action to assess whether their products comply with the maximum levels under discussion.

For these sectors, the following actions are recommended.

8.1. Mapping the supply chain and potential risk points

The potential sources of contamination are largely known, but their significance may vary greatly depending on the sector, and on national agricultural and transport practices. A first step in addressing MOH contamination is to map out the most relevant sources. As a starting point, the European food industry association FoodDrinkEurope and the German food industry association Bund für Lebensmittelrecht und Lebensmittelkunde (BLL) have developed a toolbox that gives detailed sources of MOH (including migration from packaging, transport, and processing contamination, and food additives).[9]

8.2. Data collection and analysis

Analysis of food samples at each stage in the supply chain (post-harvest[10] and before, during, and post-processing) is the most reliable way of identifying possible sources of MOH contamination, and for developing an action plan of mitigation measures. Continual monitoring will be needed to assess the success of proposed mitigation measures.

8.3. Action plan

On the basis of data collection and analysis, a series of potential strategies can be developed aimed at reducing the risk of contamination. The FoodDrinkEurope/BLL Toolbox[11] provides some examples, but the measures required to address MOH contamination are likely to be extremely specific to the sector[12] and the local context.

8.4. Communication and dialogue across the supply chain

As contamination can occur at all stages of the food supply chain, there must be a coordinated response between producers, processors, packaging suppliers, and transporters. Any action plan aimed at reducing contamination must have the involvement and support of all these actors. The public sector may also have a role to play in supporting food monitoring and the development of analytical testing capacity.

[9] FoodDrinkEurope and BLL (2018) Toolbox on reducing the transfer of mineral oils into food. FoodDrinkEurope and Bund für Lebensmittelrecht und Lebensmittelkunde.

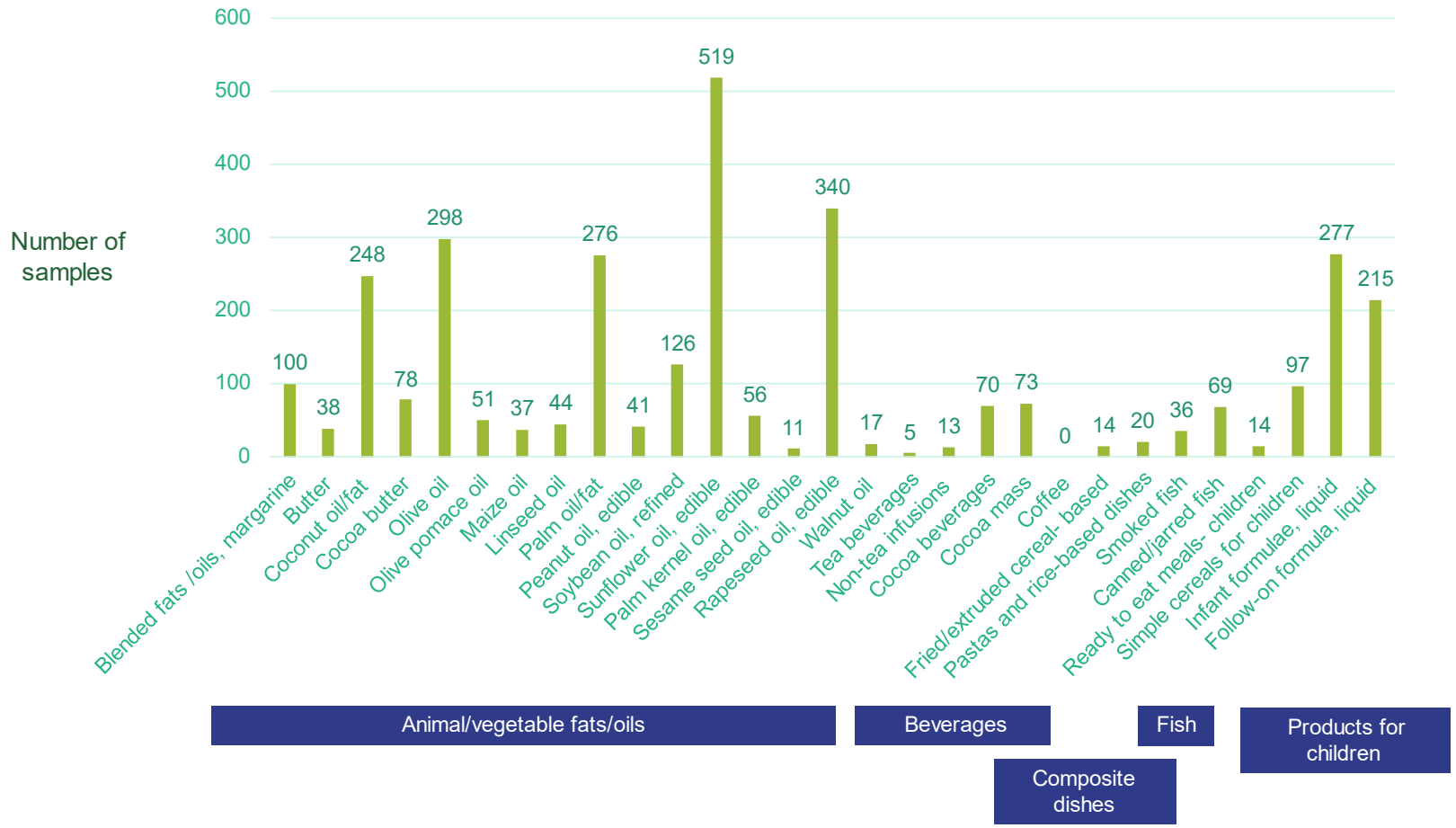
[10] One identified source of contamination is sun-drying crops near to roads, which can increase the risk of MOAH contamination from vehicle exhaust gases.

[11] FoodDrinkEurope and BLL Toolbox (2018).

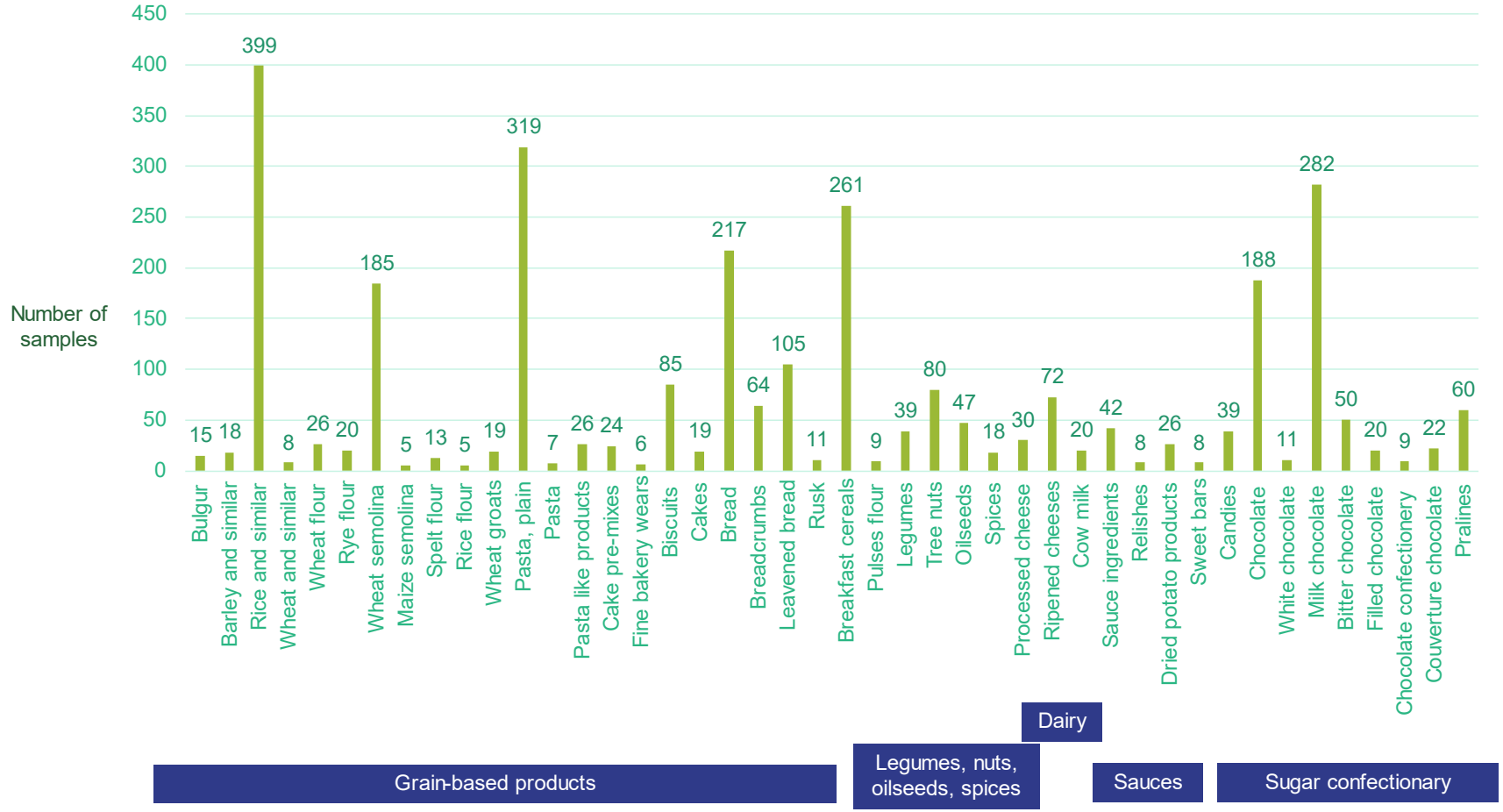
[12] Some European sector associations have developed specific guidance to support the identification of possible contamination, such as FEDIOL (2018) Code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses.

ANNEX I

Overview of the number of samples with data on MOAH analysed by EFSA (EFSA risk assessment of mineral oil hydrocarbons in food, Table 9)



Overview of the number of samples with data on MOAH analysed by EFSA (EFSA risk assessment of mineral oil hydrocarbons in food, Table 9), continued



ANNEX II

Overview of RASFF notifications related to MOAH in products of non-EU origin (2020–2025)

Country	Product
China	Sichuan pepper
Ecuador	Palm oil
Ethiopia	Coffee
Ghana	Palm oil
Guinea	Palm oil
India	Rice, curry powder, chickpea flour, urad dal flour, curcumma, psyllium husk, tea
Indonesia	Coconut oil
Iran	Pastries
Jordan	Freekeh (frik)
Madagascar	Cloves
	Vanilla powder, chocolate
Malaysia	Palm stearin, palm fat powder
Morocco	Stock cubes
Nigeria	Palm oil
Pakistan	Rice, roasted vermicelli, guar gum
Papua New Guinea	Vanilla
Peru	Coffee
Philippines	Coconut oil
Thailand	Coconut milk, herbal tea, fried garlic, lemon grass powder
	Rice oil (three alerts)
Türkiye	Cumin, red lentils
Ukraine	Sunflower oil

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