Netherlands Institute
for Sustainable Packaging

FACT SHEET

Mineral oils
in packaging

PART OF THE DOSSIER ON FOOD SAFETY

MAY 2022

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for Sustainable Packaging

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May 2022

The presence of mineral oils in packaging brings possible risks for food safety and therefore for people's health. In this fact sheet, the KIDV provides background information about mineral oils and their use in the packaging industry, about the risks of possible contamination and the legislation on this subject.

What are mineral oils?

The term mineral oils are used to distinguish oil derived from crude oil and petroleum from oil of biological (animal, vegetable) origin. Mineral oils consist of various substances, of which MOSH (mineral oils of saturated hydrocarbons) and MOAH (mineral oils of aromatic hydrocarbons) are the best known. That is what this fact sheet is about. Not all mineral oils are harmful. Some mineral oils in their pure form can be deliberately added to food, as a gloss or solvent, or as a base for chewing gum. Other mineral oils may also enter a food product 'unknowingly', from the raw material or process aids for example, without risk to food safety or human health.

This fact sheet is about mineral oils that end up as contaminants in packaging materials and can migrate to the food.

Applications and presence in packaging and materials

Mineral oils are used in the packaging industry for the following applications:

- As an additive, for example in the production of plastics or jute bags, to give them certain desired properties.
- As an additive during the production of packaging materials, for example a lubricant, anti-foaming agent, cleaning agent or anti-adhesive.

If used incorrectly, the mineral oils may end up in the packaging material and migrate into the food.

Many food products are packaged in packaging made from (recycled) paper and card. These materials may also contain mineral oils from one of the following sources:

1. Printing ink and additives used in the production of newspapers, magazines, leaflets, decorative materials, thermal paper and folding carton.

2. Chemicals from the paper production process itself, such as biocides, whiteners and release agents.

Food safety

The food safety hazard depends on the type of mineral oil, the amount contained in the packaging material and the amount released from the packaging material into the food product. There are types of oil that are not harmful and types that are.

In 2012, the European Food Safety Authority (EFSA) published an opinion on the risks of the presence of mineral oils in food (1). This showed that certain components of mineral oils have the potential to pose a risk to public health. There is evidence that the saturated hydrocarbon fraction (MOSH) can accumulate in various tissues and organs. Furthermore, aromatic hydrocarbon fraction (MOAH) is potentially carcinogenic and genotoxic and therefore their presence is of potential concern.

Following this, in 2017 the European Commission asked all member states to monitor mineral oils (2). In 2019, the Dutch National Institute for Public Health and the Environment (RIVM) declared the results of the monitoring and assessed the risk in food (3). RIVM has determined that with the current exposure to MOSH, no negative effects on public health are to be expected. For MOAH, insufficient data is available to determine current exposure. The RIVM recommends that more research is done into the health effects of exposure to MOAH.

Legislation and recommendations

European Union

The release of components of the packaging material into food products is called migration. How much substances are allowed to migrate is laid down in migration limits. For plastics, migration limits are included in the legislation. These limits are based on EFSA risk assessments, issued based on available literature.

The European Regulation on plastic materials contains a list of additives and monomers with specific migration limits. This includes three so-called MOHs (mineral oil hydrocarbons), which contain MOSH and MOAH. In this regulation, the total migration limit of all substances together is legally limited to 60 mg per kg of food. This also applies to mineral oils.

In addition to European legislation, various European countries have drawn up recommendations concerning the quantity of mineral oils in food or packaging materials.

Germany | Bundesinstitut für Risikobewertung (BfR)

The German Federal Institute for Risk Assessment (BfR) sets reference values for MOSH in paper and cardboard made from recycled fibers (4).

- 12 mg/kg of food for MOSH of chain length C_{10} to C_{16}
- 4 mg/kg of food for MOSH with chain length C_{16} t/m C_{20}.

Belgium | FAVV

The Scientific Committee of the Federal Agency for the Safety of the Food Chain (FAVV) proposes an action threshold for MOSH between 5 and 150 mg/kg of food. This limit depends on the food group. The action threshold enables the competent authority to detect deviations, whereby the origin of the contamination must be determined, and measures must be taken to reduce or eliminate this deviation.

For MOAH there are currently insufficient data available to propose action thresholds. The FAVV Committee recommends, due to the potential carcinogenicity, applying the analytical detection limit (0.5 mg/kg of food) as the action threshold(5).

The Netherlands | RIVM

The Netherlands follows the European legislation and regulations; there are no additional requirements with regard to MOSH and/or MOAH.

Control measures

The producer of packaging material is responsible for drawing up a Declaration of Compliance (DoC). This declaration indicates that the packaging material complies with the European directives. A DoC is therefore the passport to the market. The buyer of packaging materials must check this DoC and ensure that the conditions of use and food comply with the intended use of the packaging material. Both the producer and the buyer of packaging materials are responsible for controlling the possible food safety hazards which may be caused by migration of mineral oils.

Furthermore, the prevention and reduction of mineral oil migration depends on the source of the mineral oil and the type of packaging material. Following the applications previously discussed in this fact sheet, a number of examples of control measures are given below:

Additives and auxiliary agents

A possible source of contamination with mineral oils are auxiliary agents (e.g. lubricants), which are used for the production of packaging materials. To reduce this contamination risk, the use of food grade lubricants is recommended(6). These agents are suitable for incidental contact with packaging material.

Recycled paper and cardboard

The migration of mineral oil can be prevented by using a functional barrier or an inner bag consisting of aluminium, polyethylene terephthalate, metallised or coated polymeric films, or multilayer films containing a polyamide or ethylene vinyl alcohol layer. The barrier prevents or significantly reduces migration of the mineral oils present in the food product (7).

Plastics

Plastic-based functional barriers should have sufficient barrier properties, such as the right thickness and composition (8). The information on a DoC can provide further details here. The user of the packaging material must ensure that the DoC is checked and that the packaging material is used properly (2).

Printing ink

In the case of printed packaging materials, there must be a sufficient barrier between the printing ink and the food product. This prevents the printing ink from migrating into the food product. (9). In addition, mineral oil-free inks can also be used. (8).

Jute bags

Jute bags may be treated with oil to make the jute pliable. This oil may contain mineral oil and contaminate the food. This can be prevented by using jute bags that have been

produced according to IJO standard 98/01 (revised 2005) (10) or which have been treated with vegetable oils (8).

Finally

The KIDV has drawn up this fact sheet in collaboration with Riskplaza. Riskplaza is a database with information on the food safety of ingredients, as well as measures to control food safety hazards.

The greatest possible care has been taken in compiling the text; see also the appendix for the sources consulted. No rights can be derived from the texts.

If you still have questions after reading the fact sheet, please ask them in the questionnaire on the KIDV website (https://question.kidv.nl/).

Interesting links

- Packaging materials (only available in Dutch) | Voedingscentrum
- Mineral-oil | Food packaging forum
- Mineral oils (only available in Dutch) | Foodwatch
- Mineral oils (only available in Dutch) | Merieux NutriSiences
- Questions and answers on mineral oil components in food | BfR
- Toolbox for preventing the transfer of undesired mineral oil hydrocarbons into food | BLL

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NOTE: Always consult consolidated legislation at https://eur-lex.europa.eu/.

KIDV fact sheets Food Safety

This fact sheet is part of a series of KIDV fact sheets on food safety. There are fact sheets on the following subjects:

- Mineral oils in packaging materials
- Bisphenol A in packaging materials
- Microplastics in packaging materials
- Heavy metals in packaging materials
- NIAS – Not-intentionally added substances
- Legislation on food contact materials

See also our dossier page on Food Safety on the KIDV website.