

MOSH and MOAH

1. What are MOSH and MOAH?

MOSH stands for Mineral Oil Saturated Hydrocarbons. They are paraffin-like, open-chained, commonly branched hydrocarbons (e.g. alkanes) and naphthene-like cyclic hydrocarbons (cycloalkanes). MOAH stands for Mineral Oil Aromatic Hydrocarbons. They include hydrocarbons mainly consisting of highly alkylated mono- and/or poly-aromatic rings¹.

2. Why are MOSH and MOAH considered contaminants?

- MOSH and MOAH are generally not present in the original raw ingredient – in this case Fresh Fruit Bunches (FFB) – and therefore are introduced at some point into food through one or more production steps
- The input routes of mineral oils are varied and extend across food production stages from raw materials, storage, and transportation, production, to packaging materials
- The main sources of MOSH and MOAH contamination are adhesives, printer inks and packaging materials, specifically those made from recycled materials
- Other sources of these contaminations include machine and hydraulic oils that are used to produce and package food
- In production processes, mineral oils are used as lubricants for machinery and as release agents in packaging. A release agent prevents the bonding between the packaging surface and its content, for instance, meat in plastic wrapping.
- The general environment, such as exhaust gases from combustion engines and emissions from the energy supply and industrial plants, may lead to unavoidable contamination of food raw materials with Mineral Oils Hydrocarbons (MOHs).

3. Are these contaminants found in palm oil and other vegetable oils?

- Oils and fats, including palm oil, olive oil, sunflower oil, and rapeseed oil are susceptible to contamination with MOSH and MOAH due to their lipophilic properties².

4. How do MOSH and MOAH enter into food?

- MOSH and MOAH are the terms used for mineral oil hydrocarbons which can migrate into foods during production and transportation
- The contamination risks depend on many factors, such as
 - Food properties;
 - MOSH/MOAH concentration in the contamination source;
 - Type, intensity and duration of the contact and the temperature

¹

https://www.fooddrinkurope.eu/uploads/publications_documents/Preventing_transfer_of_undesired_Mineral_Oil_Hydrocarbons_into_food_FoodDrinkEurope_BLL_Toolbox.pdf

² https://www.sgs-group.de/-/media/local/germany/documents/flyers-and-leaflets/agri/sgs_faq_mosh_moah_en_0218.pdf

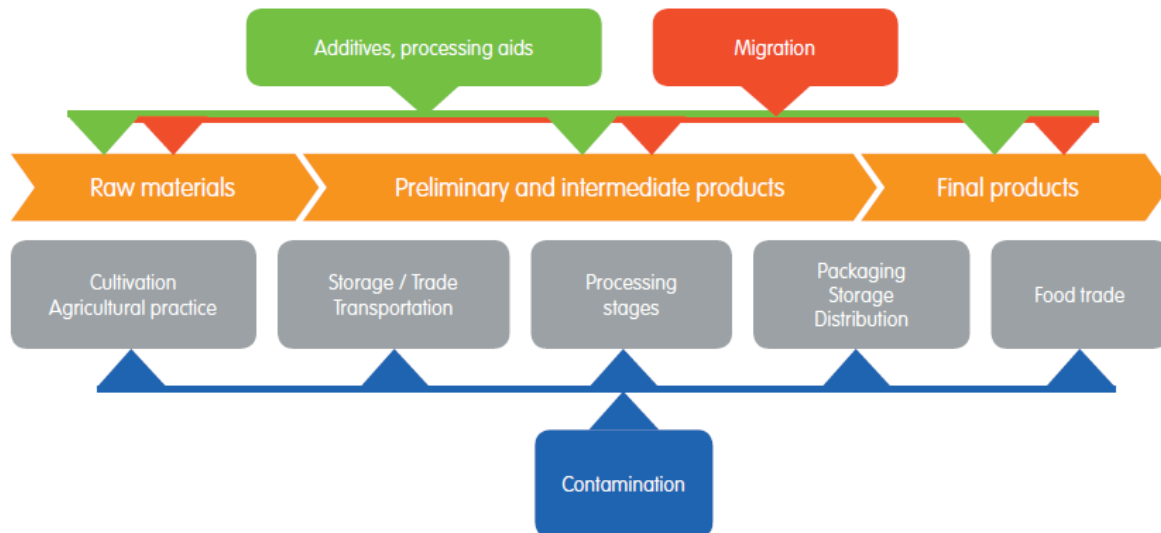


Illustration of the process of MOSH and MOAH entry into food³

5. What are the maximum levels of MOSH and MOAH in foods?

Research to-date has focused on food contamination from packaging, for example printed ink, paper, carton and cardboard materials. While there is no regulatory global standard that sets out maximum levels for MOSH and MOAH, some European authorities have outlined the recommendations below.

5.1. European Monitoring

- In 2017, the European Commission (EC) adopted recommendation EU 2017/84 on the monitoring of Mineral Oil Hydrocarbons (MOHs) in food and in Food Contact Materials. Food Contact Materials are all materials intended to come into contact with food, including packaging and containers. These can be made from plastics, paper, rubber, and metal⁴.
- The EC requested that Member States, manufacturers, processors, and distributors of food contact materials, monitor the presence of MOH in food during 2017 and 2018.
 - The monitoring covers animal fat, bread and rolls, biscuits and cakes, breakfast cereals, confectionary including chocolate and cocoa, fish meat and products, ices and desserts, oilseeds, pasta, and many more.

5.2. Belgium

- EFSA (European Food Safety Authority)⁵ sets MOSH's limits⁶ (C₁₆-C₃₅) as follows:

Products	MOSH levels
Milk and milk products	5 mg MOSH/kg
Cereals	15 mg MOSH/kg food
Vegetable products, snacks and desserts	20 mg MOSH/kg food
Products of animal origin, sugar and confectionery	30 mg MOSH/kg

³

https://www.fooddrinkEurope.eu/uploads/publications_documents/Preventing_transfer_of_undesired_Mineral_Oil_Hydrocarbons_into_food_FoodDrinkEurope_BLL_Toolbox.pdf

⁴ <http://www.efsa.europa.eu/en/topics/topic/food-contact-materials>

⁵ <http://www.efsa.europa.eu/>

⁶ <http://www.favv.be/professionelen/levensmiddelen/mineraleolie/>

Fish and fish products	60 mg MOSH/kg food
Spices and herbs	70 mg MOSH/kg food
Animal and vegetable oils	100 mg MOSH/kg food
Vegetables, tree nuts and oil seeds, and egg products	150 mg MOSH/kg food

5.3. Germany

- Germany does not have binding regulation containing legal limits in place
- For findings in food or packaging materials, evaluation may use EU Basic Regulation 178/2004 and framework regulation (EC) No 1935/2004⁷ on food contact materials.
- In paper production, the migration level of hydrocarbons (up to C₂₀) corresponding to toxicologically deduced limits are as follows:
 - 12 mg/kg food for C¹⁰-C¹⁶
 - 4 mg/kg food for C¹⁷-C²⁰
- No migration of MOAH into food will be permitted from food contact materials that are produced using recycled materials. This is according to the last (4th) draft of the German "Mineral Oil Regulation" (22th Ordinance amending the Consumer Goods Ordinance) of the Federal Ministry of Nutrition and Agriculture (BMEL) of March 2017⁸
 - The migration of <0.5 mg MOAH/kg food or food simulant is considered "undetectable"

6. What are the health risks from MOSH and MOAH?⁹

MOSH:

- A few short-chain saturated hydrocarbons of the MOSH fraction are known to accumulate in different organs of the body (liver and lymphoid system), causing adverse effects.
- MOSH of C16 to C35 may damage the liver, lymph nodes, and spleen.
- EFSA¹⁰ estimates the quantities of MOSH absorbed daily is between 0.03 and 0.3 mg per kg of body weight.

MOAH:

- MOAH is potentially carcinogenic though there are not sufficient data for the development of limit values¹¹ MOAH strict minimisation is required with no migration into food

7. What is GAR doing to resolve MOSH and MOAH issues?

- GAR is committed to ensure that our products are safe for consumption.
- Through our investment in state of the art, ISO 17025 accredited R&D and Quality Control (QC) facilities at our refinery in Marunda¹², we continue to improve our practices to ensure we provide high quality products.

⁷ [https://www.europarl.europa.eu/RegData/etudes/STUD/2016/581411/EPRS_STU\(2016\)581411_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2016/581411/EPRS_STU(2016)581411_EN.pdf)

⁸ https://www.bmel.de/DE/Startseite/startseite_node.html

⁹ https://www.sqsgroup.de/-/media/local/germany/documents/flyers-and-leaflets/agri/sqs_faq_mosh_moah_en_0218.pdf

¹⁰ https://publications.jrc.ec.europa.eu/repository/bitstream/JRC115694/kjna29666enn_2.pdf

¹¹ <https://www.healthyprinting.eu/workspace/uploads/imagefolder/factsheet-mosh-moah.pdf>

¹² <https://goldenagri.com.sg/10-facts-about-palm-oil-food-production-at-marunda-rd-centre/>

- Our refineries are implementing Quality and Food Safety Management System (ISO 22000/FSSC 22000), and these MOSH/MOAH risks have been taken into consideration in this system.
- We are a leading and committed producer of high quality oils – therefore we share the concerns of other manufacturers working to minimise risk of contaminants.
- In 2019, GAR started an internal study into the MOSH and MOAH issues engaging a third party laboratory in Germany, testing samples from our refineries and investigating potential mitigation options.
- Critically, the study covers our entire supply chain - own refineries, own mills and 3rd party mills - to identify the critical process points where the contaminants are introduced.
- We are keeping interested customers updated on our progress.
- GAR continually monitors for any developments in the industry and with authorities, both domestic and in destination markets.

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