

04.

**Practical mitigation
strategies – what can we do?**

4. Practical mitigation strategies

The food industry must put considerable effort into tackling MOH contamination, focussing on:

- mitigating risk in their own processes (lubrification, packaging, leakages)
- communicating with suppliers (**worldwide!**)
- mitigating risk in cooperation with “willing” suppliers:
 1. Identify “risky” suppliers / products
 2. Problem-auditing of those suppliers, prioritising those, that are “willing” and cooperating
 3. “step-testings & analytics” from farm to delivery



4. Practical mitigation strategies

Example 1



Linseed / flaxseed (Kazachstan) – seed delivered to Germany and pressed in Germany

Steps in Kazakhstan:

harvesting → unloading → sieving → (drying) → storage

Steps in Germany:

pressing → filling

4. Sources of MOH

harvesting → unloading → sieving → (drying) → storage



diesel & lub



(indirect) drying



leakages on the concrete-floor
contact with asphalt-floor?

Migration path: Extensive Lub in Bearings!

4. Practical mitigation strategies

Example 2



Coconut-oil from the Philippines – raw oil pressed in the Philippines, refining in Europe.

Steps in the Philippines:

harvesting → crackting the nuts → drying of the „meat“ → copra → pressing

Steps in Europe:

refining → filling

4. Sources of MOH

harvesting → cracking the nuts → drying of the „meat“ → copra → next page



direct drying



sundrying / sun is always shining?

4. Sources of MOH

last page → drying of the „meat“ → copra → pressing



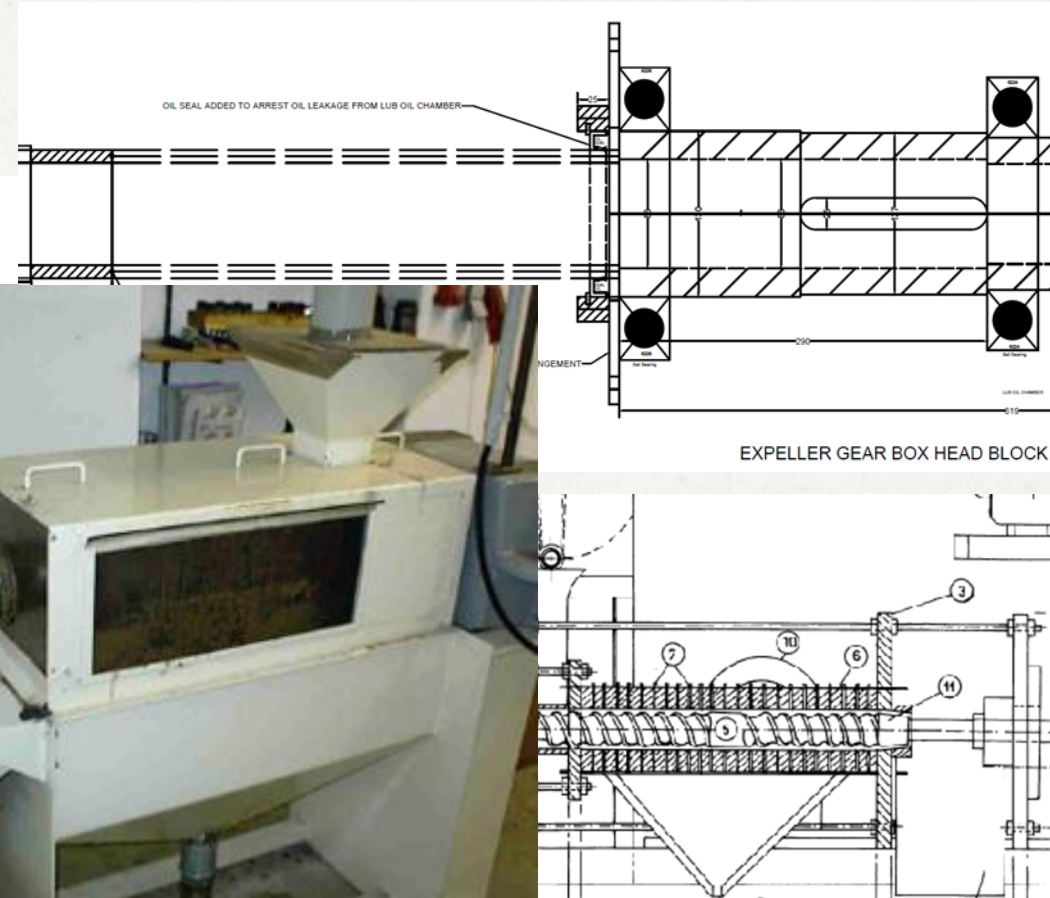
indirect drying



reused bags



expeller presses (leakages / lub)

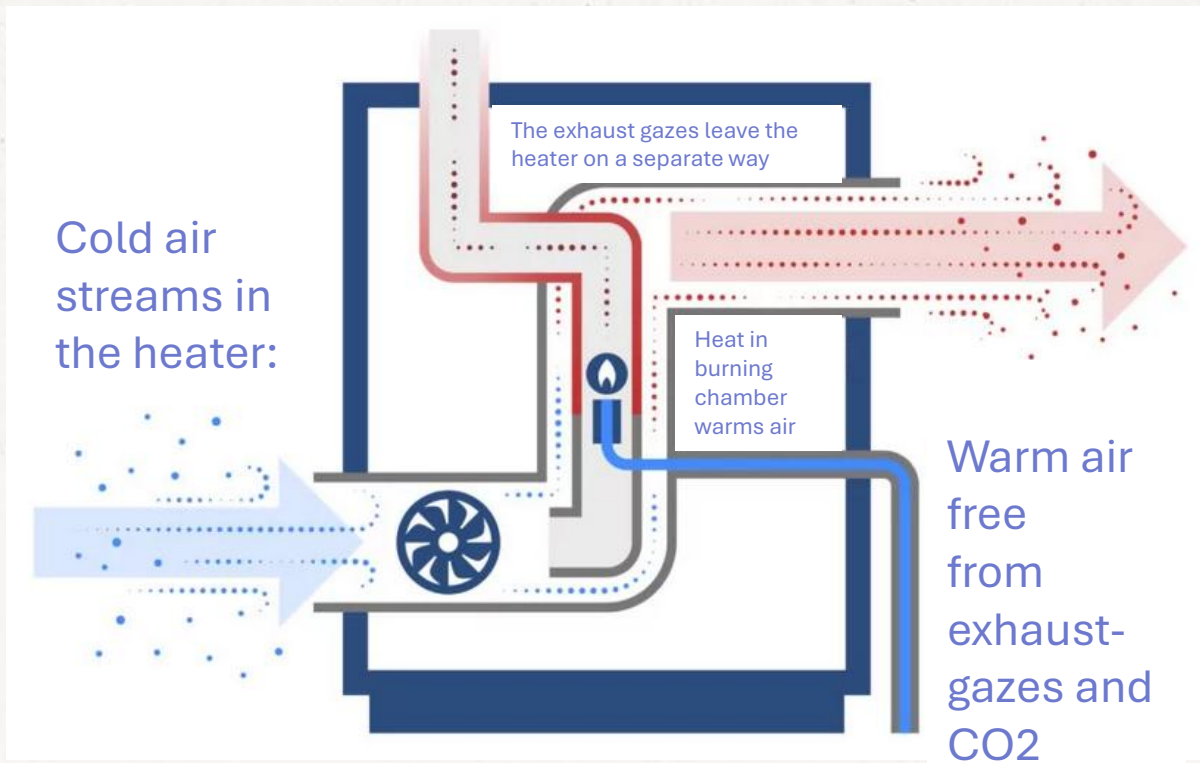


Migration path: Exhaust fumes from direct drying!

What steps can be taken?

Indirect drying is key to avoid contamination

Alternative:
solar-drying!



4. Practical mitigation strategies

Example 3



Olive oil from Europe – harvesting and pressing in Southern Europe

Steps in Southern Europe:

harvesting → collecting → milling → malaxation → centrifuging
→ filtration / decanting (tank)

4. Sources of MOH



exhaust-fumes of harvesting machines



hydraulic system of harvesters
(leakages)



Sources of MOH



cutting of the trees (with olives)
(exhaust fumes)



storing in jutebags in the plantations



Sources of MOH



gearboxes



bearings at hoppers



hydraulic mechanisms at hoppers
(leakages)



lubrification of malaxeurs / presses
(leakages)



Migration path: Jute bags!

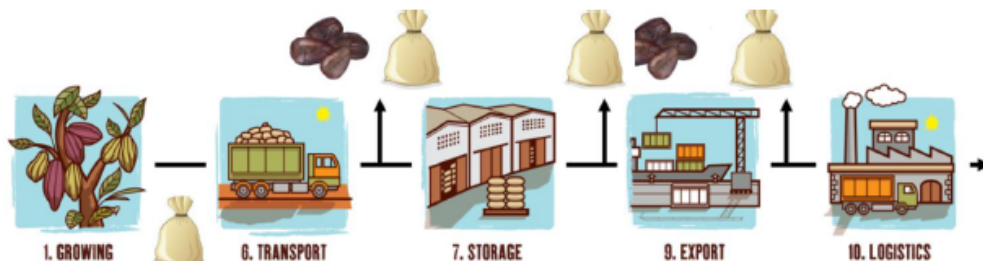
Jute bags: What steps can be taken?

SOURCES OF MOH CONTAMINATION IN COCOA

Research conducted by University of Liège and IJRA on behalf of cocoa and jute sectors

Phase 1 (2020-2021). Identification of MOH entry points in transport and storage & migration studies

- Contamination during **storage & transport** → **contact time** matters!
- Migration through **shell to fat** components in beans
- Jute bags main contributor to contamination



Phase 2 (2023-2024). Survey of jute bags in supply chain & development of specification for suitable jute bags

- **Used bags** more contaminated than new/export bags
- Similar contamination in IJO98-compliant bags & mineral oil-batched bags → **IJO98 standard inadequate**
- Need to consider **lubricating oils and cross-contamination** in production environment as contamination sources

Executive summaries available at
jointcocoaaresearchfund.eu



Jute bags: What steps can be taken?

SHORT TERM ACTION: ADOPTION OF INDUSTRY SPECIFICATION



eca
european cocoa association

Industry Specification

Jute Bags – Jute Yarns for Use in Cocoa Supply Chains

- Based on 2023-2024 study by University of Liège
- Current alternative to IJO98 standard
- Goal: minimise MOH contamination through jute bags
- Analytical criteria
 - MOAH: < 25 mg/kg
 - MOSH: < 250 mg/kg
- Also **important** to prevent contamination:
 - Good manufacturing practices
 - Food-safe processing materials (batching oils, printing inks, lubricants)

- ➔ Widely promoted within the sector
- ➔ Interest from other sectoral associations in endorsement / adoption
- ➔ Available on ECA website



Jute bags: What steps can be taken?

ROADMAP TO ADDRESS MOH CONTAMINATION MEDIUM-LONG TERM ACTION: DEVELOPMENT OF STANDARD

1st
step

WTO Standards & Trade Development Facility (STDF) Project Preparation Grant

Developing and implementing a new standard for food safe jute for use in the cocoa sector

Partners



Implemented by



Objectives

1. Develop framework for **standard** for food safe jute for use in cocoa
2. Prepare full **project proposal** to
 - Strengthen **capacity** to comply with such standard
 - Develop **Code of Practice** incl. for (re-)use of bags

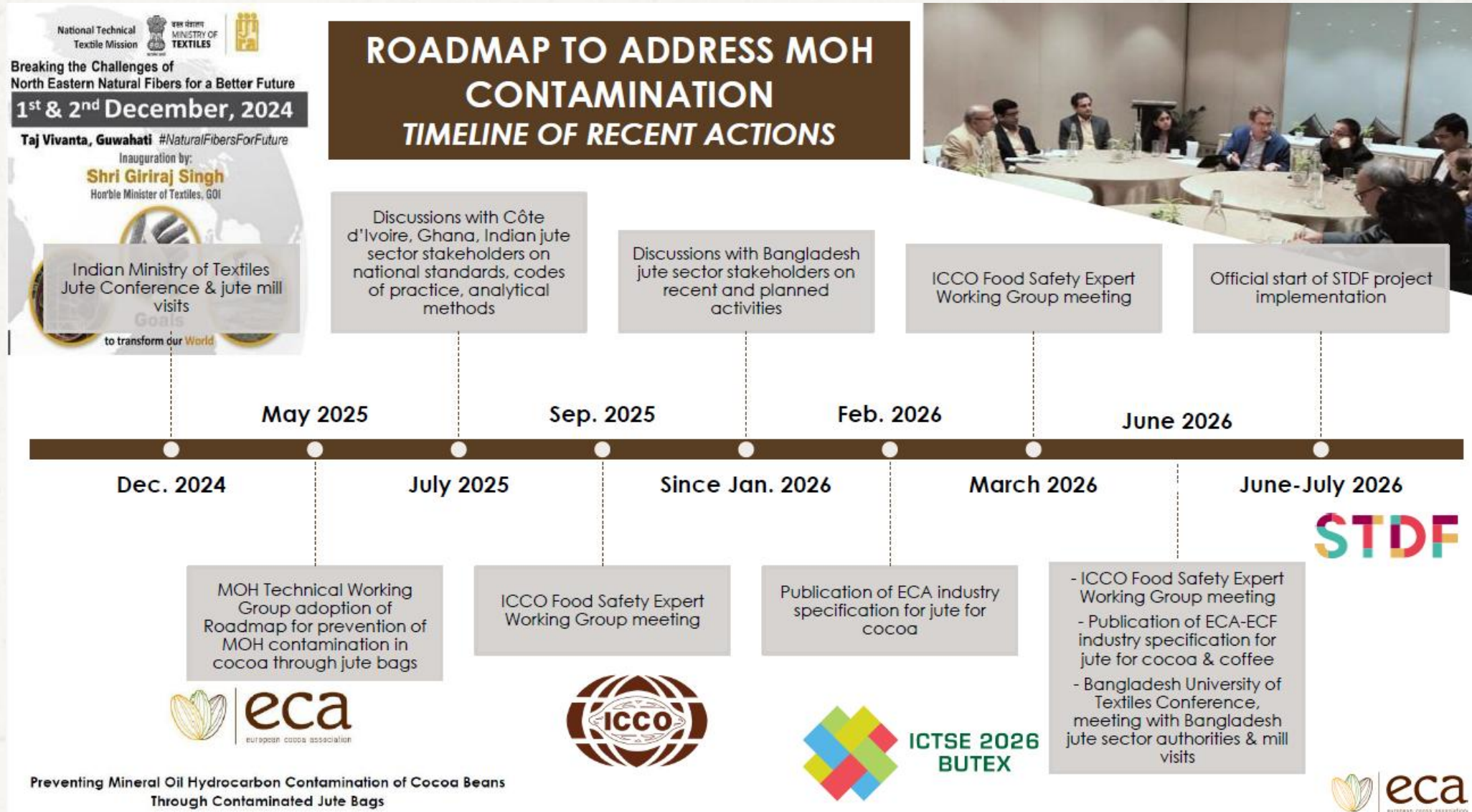
2nd
step

PPG Activities

- **Review** of jute bags manufacturing/use & MOAH contamination in jute & cocoa producing countries
- **Assess capacity** for food grade jute bags production & testing
- **Stakeholder engagement** for standard development



Jute bags: What steps can be taken?



PRÜFERGEBNISSE

Physikalisch-chemische Untersuchung

MOSH/POSH (gesättigt, kurzkettig) C10-16	<0,6	* mg/kg
MOSH/POSH (gesättigt, mittelkettig) C16-20	<0,6	* mg/kg
MOSH/POSH (gesättigt, längerkettig) C20-25	<0,6	* mg/kg
MOSH/POSH (gesättigt, längerkettig) C25-35	<0,6	* mg/kg
MOSH/POSH (gesättigt, längerkettig) C35-40	<0,6	* mg/kg
MOSH/POSH (gesättigt, längerkettig) C40-50	<0,6	* mg/kg
MOSH/POSH C10-50	<0,6	* mg/kg
MOSH/POSH nachgewiesen im Bereich von	-	
MOAH (aromatisch) C10-16	<0,15	* mg/kg
MOAH (aromatisch) C16-C25	<0,15	* mg/kg
MOAH (aromatisch) C25-35	<0,15	* mg/kg
MOAH (aromatisch) C35-50	<0,15	* mg/kg
MOAH C10-50	<0,15	* mg/kg
MOAH nachgewiesen im Bereich von	-	

4. Analytics – What happened here?

PRÜFERGEBNISSE

Physikalisch-chemische Untersuchung

MOSH/POSH (gesättigt, kurzkettig) C10-16	<0,6	* mg/kg
MOSH/POSH (gesättigt, mittelkettig) C16-20	<0,6	* mg/kg
MOSH/POSH (gesättigt, längerkettig) C20-25	1,2	mg/kg
	± 0,7	mg/kg
MOSH/POSH (gesättigt, längerkettig) C25-35	4,1	mg/kg
	± 1,6	mg/kg
MOSH/POSH (gesättigt, längerkettig) C35-40	0,80	mg/kg
	± 0,49	mg/kg
MOSH/POSH (gesättigt, längerkettig) C40-50	0,72	mg/kg
	± 0,46	mg/kg
MOSH/POSH C10-50	7,4	mg/kg
	± 2,8	mg/kg
MOSH/POSH nachgewiesen im Bereich von	C16-C52	
MOAH (aromatisch) C10-16	<0,15	* mg/kg
MOAH (aromatisch) C16-C25	0,69	mg/kg
	± 0,29	mg/kg
MOAH (aromatisch) C25-35	1,3	mg/kg
	± 0,6	mg/kg
MOAH (aromatisch) C35-50	1,2	mg/kg
	± 0,5	mg/kg
MOAH C10-50	3,2	mg/kg
	± 1,2	mg/kg
MOAH nachgewiesen im Bereich von	C16-C52	

05

Finding good, reliable labs
Managing sampling & analytics

Identifying reliable labs

- ❑ Testing for MOHs requires resources, time and experience.
- ❑ If labs not available in exporting country (insufficient demand or awaiting validation), sub-contacting to experienced labs is a valid option.
- ❑ Many capable, experienced labs **in Europe**, also **some in Asia**
- ❑ **Indicative list of EU labs:** EURL-PC has compiled list of laboratories able to analyse total MOAH content at required LOQs*. List available upon request via e-mail to **eurl-pc@food.dtu.dk** with 'GET MOAH LAB LIST' in the subject field.
- ❑ In order not to send the samples to Europe, multinational labs present in export country/ regions could be contacted. They will organize internally sample shipping to EU colleagues.
- ❑ Alternatively, ask your customers in EU to support you in analyzing the samples for you.



**with the understanding that neither the EURL-PC (European Union Reference Laboratory for Processing Contaminants) nor the European Commission in any way authorise, endorse or scrutinise the information given by the laboratories.*

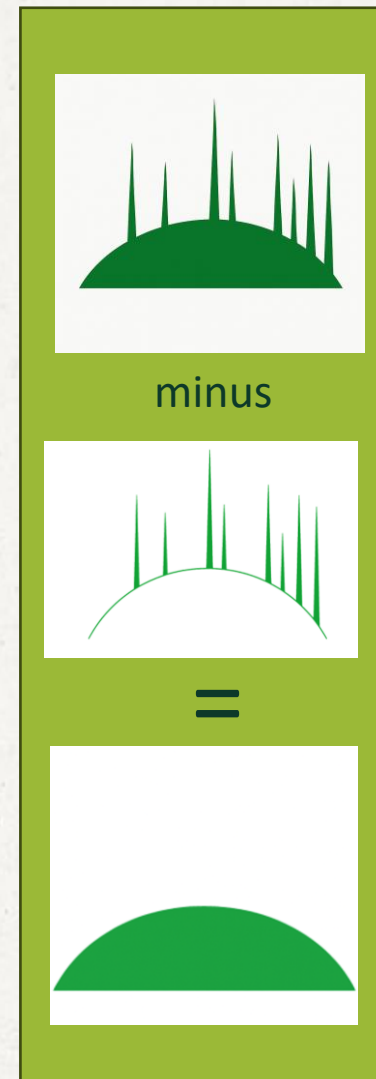
Complexity of analytics

Recommended method

- ❑ „**LC-GC-FID**“ method, which is based on the [JRC Guidance](#) and is documented in ISO-Norm: [DIN EN ISO 20122:2025-06](#) :
- ❑ Guidance allows different sample **pre-treatments**, depending on the matrix.
- ❑ Regulation (EC) No 333/2007 (due to be [amended](#) (probably Oct. 2026) sets out [requirements](#) of this analytical method.

How to deal with interfering substances

- ❑ Biogenic substances naturally present in plants might disturb the analysis e.g. in ***spices, volatile oils & oils***
- ❑ This can result in **false negative or positive results** if lab is not experienced
- ❑ **Interferences can be removed** through sample pre-treatments, such as **epoxidation**
- ❑ In case of doubt MOAH presence versus interferences can be confirmed **with „GCxGC“** (see [Guidance](#))



Possible sample contamination: containers



Managing contamination

- ❑ Even using experienced labs if not **using not suitable sample-containers (pouches, jars, bottles...)**, you will get results that are not reproducible and reliable
- ❑ This could lead you to wrong conclusions and follow-up strategies.
- ❑ The EU proposes detailed steps in Regulation 333/2007 (amended [Annex](#)) in a detailed way:*

‘B.1.3. Precautions to be taken

While sampling, precautions shall be taken to avoid any changes which would affect the levels of contaminants, adversely affect the analytical determination or make the aggregate samples unrepresentative.

For the sampling for analyses of mineral oil hydrocarbons in food, materials used during sampling, sample storage and sample transmission shall be free of mineral oil residues and shall not release interfering substances. The sample shall be handled in order to prevent cross-contamination.’;



Containers to be used (Regulation 333/2007 (amended [Annex](#)):

- Plastic containers should be avoided / **in any case checked** / as the samples could be analyzed MOSH-false positive
- Lid: prefer glas-stoppers or a PTFE-layered lid – alternative: cover lid/surface with Al-foil.
- **No rubber rings shall be used to close containers**
- Prepacked food: wrap with Al-foil in order to avoid cross-contamination
- **Avoid** paper or plastic-labels / **cardboard**
- **Containers and Al-foil should be checked for mineral oil hydrocarbons contamination**

To be safe check container one time – prior to using them. Whether a container is suitable or not depends on the combination of „container“ and your product inside!

06.

Questions Discussion

Questions Discussion



How I can support

Safety First



<https://foodqsafetyfirst.jimdosite.com/>

I could help you to find the traces!



AGRiNFO



| Thank you



AGRINFO



References/sources:

[1.] Food Drink Europe 2018 – “Toolbox on reducing the transfer of mineral oils into food”

Published: 03/09/2018,

<https://www.fooddrinkeurope.eu/resource/preventing-transfer-of-undesired-mineral-oil-hydrocarbons-into-food/>

open resource

[2.] Claus-Michael Brieber, 2024, own measured values [not published: MOSH and MOAH was reduced by about 40% during a desodoration step. Reduction depended on the C-fractions of the MOSH and MOAH: about 60% reduction with C10-25 fraction, higher fractions > C25 – reduction < 20%.

[3.] Drawing: Claus-Michael Brieber – based on studies: “Minimierung von Mineralölbestandteilen in Speiseölen”, Max Rubner-Institut, Dr. Ludger Brühl.

<https://www.mri.bund.de/de/institute/sicherheit-und-qualitaet-bei-getreide/forschungsprojekte/mosh-moah/>

[4.] Agrinfo / Colead 2024: „Mineral Oil Hydrocarbons in Food“

https://resources.colead.link/en/system/files/file_fields/2024/10/10/agrinfo---mineral-oil-hydrocarbons-in-food-2024.pdf

[5.] Dr. Torben Kuchler [SGS], 2025, presentation at the „16th Akademie Fresenius QS-Leiter-Treffen“ in Cologne, 17th and 18th of June 2025