Q&A on MCPD esters and Glycidyl Esters

**MCPD and MCPD esters, occurrence in vegetable oils and fats and in food (complex food matrices), analytics and implications for human health**

1. **What is 3-MCPD and in which foods does it occur? And 2-MCPD? Why?**
   
   3-MCPD (3-monochloropropane-1,2-diol) is a recognized contaminant formed during food processing through acid hydrolysis of vegetable proteins (for example, in the production of soya sauce). It occurs in foods containing fat and salt when they are exposed to high temperatures during production, as explained by EFSA.

   3-MCPD may also occur at low levels in other foods such as bakery products (dark toast/crust of the bread), malt, cooked/cured fish or meat.

   2-MCPD is a less known compound, for which further research is needed.

2. **What are the implications of 3-MCPD for human health? And 2-MCPD?**

   European and national scientific authorities have set a limit on the maximum amount of 3-MCPD that could be consumed on a daily basis without negative impact on health. Regulatory limits for 3MCPD are defined in EU law for soya sauce and for hydrolysed vegetable protein.

   The European Food Safety Authority (EFSA) risk assessment, as due by end 2015, is expected to contribute to enhance knowledge on 2-MCPD and 3-MCPD.

3. **What are 2 and 3-MCPD esters and in which foods do they occur?**

   2-MCPD esters and 3-MCPD esters are compounds formed during the processing and refining of vegetable oils and fats.

   2 and 3-MCPD esters were only recently discovered. They have been found in refined vegetable oils and fats, and manufactured products containing such oils and fats.

   A number of different factors contribute to their formation, for example, the temperature applied to the processing seems to be one factor. Research is ongoing to better understand the formation processes.

   Methods are today available to identify MCPD esters in vegetable oils and fats. For other foods, European methods are now available since March 2015 (see below under question 7 for further details).
The vegetable oil and fat industry is monitoring levels to contribute to have a better understanding of this complex issue.

All available data will be used by the European Food safety Authority (EFSA) to assess these substances by end 2015.

4. What are the implications of MCPD esters for human health?
Available scientific studies indicate that MCPD esters are comparable to MCPD.

National and EU authorities have not indicated that consumers should change their dietary habits.

A detailed scientific risk assessment is currently been performed by the European Food Scientific Authority (EFSA) and is expected by end 2015. For more details on the risk assessment and what it entails in practice, see here.

Glycidyl esters, occurrence in vegetable oils and fats and in food (complex food matrices), analytics and implications for human health

5. What are glycidyl esters and in which foods do they occur? What are their levels in vegetable oil and fats?
Glycidyl esters are substances formed during the processing and refining of vegetable oils and fats.

Glycidyl esters are found in foods that contain refined vegetable oils and fats. It is likely that they have been part of the human diet from the time man started eating cooked food.

Methods are today available to identify glycidyl esters in vegetable oils and fats. For other food categories, European methods are now available since March 2015 (see below under question 7 for further details).

The vegetable oil and fat industry is monitoring levels to contribute to have a better understanding of this complex issue.

All available data will be used by the European Food safety Authority (EFSA) to assess these substances by end 2015.

6. What are the implications of glycidyl esters for human health? What is the view of risk assessors?
National and EU authorities have not indicated that consumers should change their dietary habits.

A detailed scientific risk assessment reviewing available science is currently being performed by the European Food Scientific Authority (EFSA) and is expected by end 2015. For more details on the risk assessment and what it entails in practice, see here.
Analytics of MCPDE and GE

7. What are the methods applicable to test MCPD esters and glycidyl esters in vegetable oils and fats? Is the same true for processed foods?

In the recent years, huge efforts have been made in developing and evaluating analytical methodologies for MCPD esters and glycidyl esters in vegetable oils and fats, in order to find appropriate and reliable methods. As a result, three validated methods of analysis (developed by SGS, DGF and Unilever) to test MCPD esters and glycidyl esters in vegetable oils and fats are available today\(^1\).

Methods for more complex food products have been made available since March 2015. The Joint Research Center (JRC) developed and validated methods for the analysis of MCPD (both in free and ester form) and glycidyl esters in various food matrices\(^2\).

Industry actions and mitigation measures

8. What is the vegetable oil industry doing?

The vegetable oil and fat industry is committed to food safety. Each vegetable oil and fat is subject to the highest standards of quality and safety controls, from the seeds to the bottle. Our industry is working with scientific experts and EU authorities to better understand this complex issue.

Despite the complex issues involved, the vegetable oil and fat industry is committed to continue investing in mitigation measures to prevent and reduce MCPD esters and GE and to disseminate information through the whole supply chain.

The work undertaken so far was shared with EU authorities.

FEDIOL also contributed to the upcoming EFSA risk assessment by providing data.

New actions, incl. a new data collection with more recent data samples, are already scheduled and will also be shared with EU authorities. FEDIOL continues to respond to EFSA call for data on 3-MCPDE and GE, and as from 2015 on 2-MCPDE. Approx. 1300 additional data samples covering the period 2014-2015 were provided to EFSA in March 2015. For more information on EFSA data collection and monitoring, see here.

For more details, see below:
FEDIOL also initiated the development of a new intake model. So far, it proved difficult to estimate the intake of vegetable oils and fats in the diet in a comprehensive way. The contribution of each vegetable oil and fat to the diet of a citizen in Europe is not necessarily known and is often “hidden” in food products. Following an assessment of existing databases and their limitations and gaps, it was

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1 AOCS Official Method Cd 29a-13 Approved 2013: 2- and 3-MCPD Fatty Acid Esters and Glycidol Fatty Acid Esters in Edible Oils and Fats by Acid Transesterification; AOCS Official Method Cd 29b-13 Approved 2013: Determination of Bound Monochloropropanediol-(MCPD-) and Bound 2,3-epoxy-1-propanol (glycidol-) by Gas Chromatography/Mass Spectrometry (GC/MS); AOCS Official Method Cd 29c-13 Approved 2013: Fatty-acid-bound 3-chloropropane-1,2-diol (3-MCPD) and 2,3-epoxy-propane-1-ol (glycidol), Determination in Oils and Fats by GC/MS (Differential Measurement). (It should be mentioned that 2 out of the 3 methods listed hereonbefore enable to test 2-MCPD esters).
decided to develop a new model, using polyunsaturated fatty acids (PUFA) as a marker. PUFA are found in all types of vegetable oils and fats. The new model represents therefore the best estimation of vegetable oils and fats consumption to date per type of oil/fat.

The model has been assessed by external experts and its scientific publication will undergo peer-review, before being made publicly available.

9. Is it possible to reduce MCPD esters and glycidyl esters? Which measures are available?
Despite the complex issues involved, industry is striving to implement measures to prevent and reduce MCPD esters and GE.

Understanding MCPD esters and glycidyl esters is a food value chain wide concern. FEDIOL and its members are committed to share information and experience that they have gained.

10. What will industry do as next steps?
FEDIOL and its members will continue to invest resources in MCPDE and GE to progress in understanding the issue, and in researching and implementing ways to prevent and reduce these substances.

Industry will continue to further share information and expertise with all relevant stakeholders.

Industry will further work with scientific experts and EU authorities to better understand this complex issue.