

Reliability of 3-MCPD, 2-MCPD and Glycidol ester determination according to AOCS Cd 29c-13 (iso 18363-1)

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2- and 3-MCPD and Glycidol are formed during the refining of fats and oils. During digestion, 2- and 3-MCPD esters (MCPDe) and Glycidol esters are converted to free 2- and 3-MCPD and free Glycidol, which are considered carcinogenic. It is therefore necessary to monitor their levels in different food matrices, such as infant formula. There are different methods for the analysis of 2- and 3- MCPDe and Glycidol esters – this study focuses on fully automated sample preparation including analysis using the AOCS Cd 29c-13 method (c-method).

In this study we investigated the influence of deviations from the standard method on the accuracy of the analytical results. Small errors in sample preparation can have a significant impact on analytical measurements, potentially leading to underestimation of 3-MCPD contents in samples.

For this study, the c-method was comprehensively automated using a robotic autosampler equipped with sample preparation modules such as vortex-like shaking during extractions and an automated evaporation station (mVAP). Evaporation of the sample and dissolution in fresh solvent allows for higher sensitivity and ensures that the required limit of detection can be reached even when using a single quadrupole mass spectrometer, as well as removing excess derivatization agent that might otherwise influence system stability.

The AOCS Cd 29 c-13 method is very tedious and has a high potential for human errors in manual sample preparation, with a high risk for underestimation of the carcinogenic compounds and possible health risks. The influence of the purity of the stopping reagents was investigated as well as incorrect reaction times and common problems known to occur during 2-MCPD determination.

Additionally, the Zwagerman/Overman (ISO 18363-4) method and the AOCS Cd 29a-13 method (a-method) were automated in order to compare the methods in a reproducible manner without any influence from human laboratory personnel.

Overall, this study provides further insights into the susceptibility of 2- and 3-MCPD and Glycidol determination to external influences and errors during sample preparation to improve the robustness of the method and lead towards safer food in the future.