

(1) Max Rubner-Institut, Institut für Sicherheit und Qualität bei Milch und Fisch, Hamburg, Germany

(2)* HAW Hamburg – Ulmenliet 20 – 21033 Hamburg – Tel.: +49-(0)40-42875-6163 – Jan.Fritsche@haw-hamburg.de

Development of an analytical method for the determination of 2- and 3-MCPD fatty acid esters in fish and fish products

1 Scope

3-MCPD (3-Monochloropropane-1,2-diol) is a food processing contaminant formed by heating foods containing a source of salt and fat.

The IARC has classified 3-MCPD as a “possible human carcinogen” (group 2B) [1]. 3-MCPD in food is present not only in unbound form, but also as mono- or di-esters of fatty acids. Further identified forms are 2-MCPD (2-Monochloropropane-1,3-diol) and glycidyl esters.

Limited data on occurrence of these contaminants in fish and fish products have been published [2].

The aim of this project was to develop an analytical method for the specific determination of 2- and 3-MCPD fatty acid esters in fish and fish products.

3 Materials & Methods

(I) Reference substances

- 1,2-bis-Palmitoyl-3-Chloropropanediol
- 1,2-bis-Palmitoyl-3-Chloropropanediol-d₅
- rac-1,3-bis-Stearoyl-2-Chloropropanediol
- Glycidyl stearate

(II) GC-MS

- GC: Varian CP-3800
- MS: Saturn 2200

Quantifying ions:

- 3-MCPD: 149, 150, 201
- 2-MCPD: 196, 201
- 3-MCPD-d₅: 146, 147, 196

Quantification

Single-point calibration

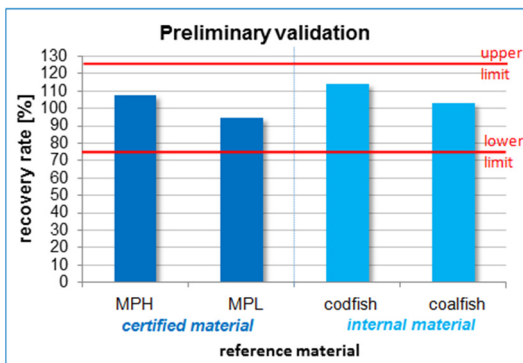


Fig. 2: Preliminary validation of the developed method with certified (MPH/L = milk powder high/low content of 2-/3-MCPD) and internal reference material

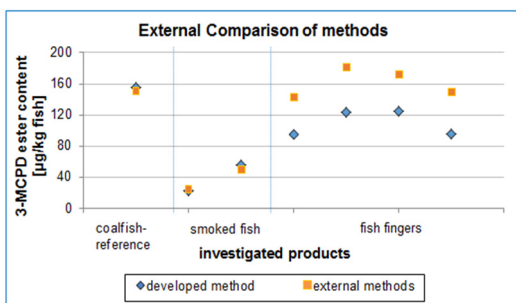


Fig. 3: Comparison of the developed method with methods of an external commercial laboratory

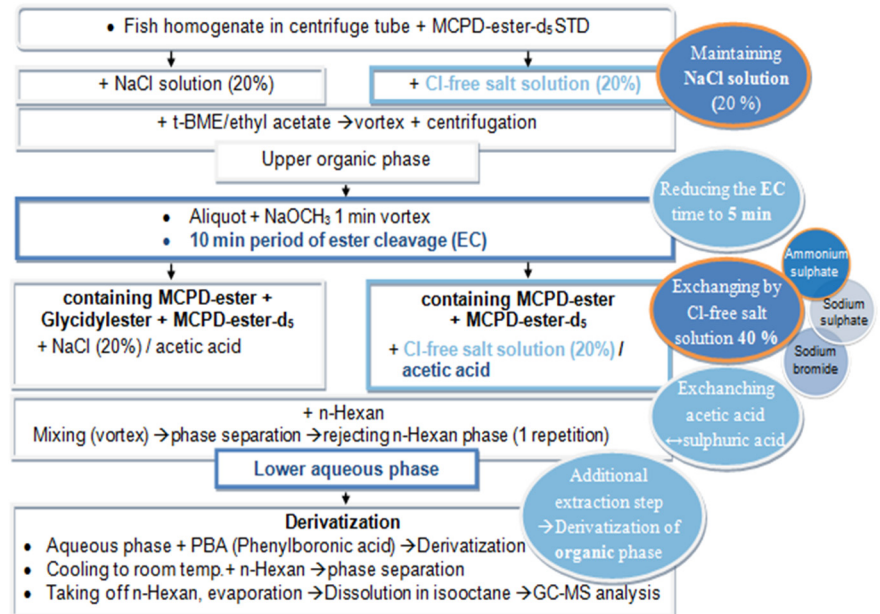


Fig. 1: Basis-Method [3] for determination of a sum parameter of 2-/3-MCPD ester and Glycidylester (left side) and developed method for specific determination of 2-/3-MCPD ester (right side). The circles represent the optimized steps of the method development.

4 Conclusion

• The developed method is robust, quickly and easily practicable

- Key step for specific determination of 2-/3-MCPD ester (Fig. 1): Solution free of chloride
→ Ammonium sulphate solution (40%)
- Limit of detection: ~ 30 µg/kg
- Successfully preliminary validation with internal and external reference material (Fig. 2)
- Comparable values by external method comparison (Fig. 3)

• Investigation of various product groups shows variable contents (Fig. 4)

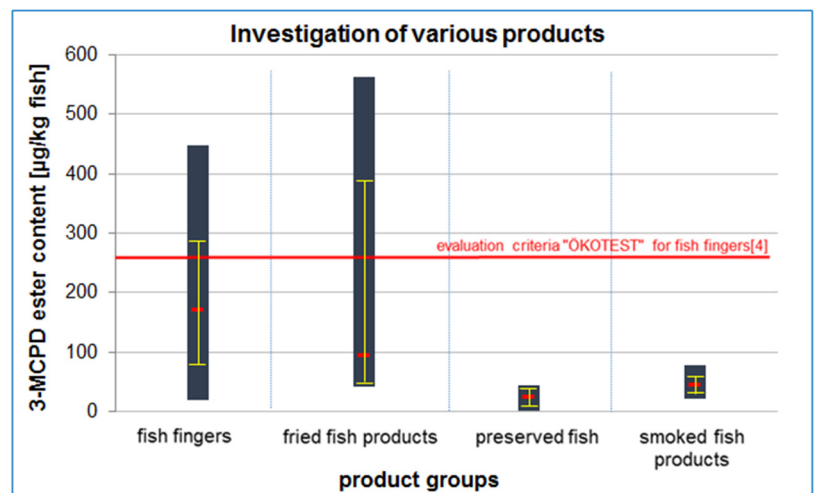


Fig. 4: Investigation of various products from different product groups (min. and max. content, Median, 10th and 90th percentile)

Acknowledgement

We wish to thank Mrs. Iris Bagge from the Max Rubner-Institut for technical support.