



## Contaminants in food

Chiron has built up a strong track record of supplying new reference standards during the past 28 years of operation. We are proud to announce our offer of Contaminants and Impurities for Food Analysis. In this leaflet you will find analytes within the following categories:

### Toxic compounds formed during food processing:

3-MCPD and Glycidyl fatty acid ester, Acrylamide, Furan, Stigmastadienes, PAH's



### Food packaging contaminants:

Plasticizers, 2-Ethylhexanoic acid, SEM, Ethyl carbamate, ITX



### Environmental contaminants:

PFOS / PFC's, Pesticides and other POPs



The basis of a good analytical method is the availability of appropriate standards of defined purity and concentration. Our mission is to market highly purified calibrates in crystalline as well as standardized solutions for chemical analysis, including internal standards.

Your benefits using our standards include

- ◇ Fast turnover time due to excellent service
- ◇ Guaranteed high and consistent quality
- ◇ Sufficient capacity to serve the market, and bulk quantities available on request
- ◇ Custom solutions on request.

Reference materials (RM) play an important role as they build the link between the measurement result in the laboratory and international recognized standards in the traceability chain. Our standards are made according to the general requirements of ISO 9001. In 2011 we started to implement ISO 17025 and ISO guides 30-35.

### Other relevant food analysis literature:

**Food Safety I (BMF 29): Natural Toxins; Mycotoxins, Plant toxins and Marine toxins.**

**Food Safety II (BMF 30): Food Contaminants.**

**Food Safety III (BMF 31): Food Colours and Aroma.**

**Allergens: BMF 47.**

**Glycidyl fatty acid esters: BMF 56.**

**Melamine: BMF 48.**

**3-Monochloropropanediol esters (3-MCPD esters): BMF 49.**

**Plasticizers, Phthalates and Adipates: BMF 32 and BMF 50.**

**PFCs (Perfluorinated compounds) including PFOS and PFOA: BMF 20.**

**PCBs: BMF 14.**

**PBDEs (flame retardants): BMF 15.**

**Pesticides: BMF 33 and 34, and the Chiron catalogue 2008.**

**(“The Biomarker Catalogue - The Collection of Reference Standards 2008”): Pages 367-372.**

**Fatty acid and FAME's; see the Chiron catalogue 2008, page 425-428.**

## Toxic compounds formed during food processing

3-Monochloropropanediol (3-MCPD) and glycidyl fatty acid esters are formed during food processing e.g. deodorization of vegetable oil. They are metabolised in the human body to toxic substances like 3-MCPD.

Chiron No.	Product	Description
	<b>3-MCPD</b>	
3873.3-K-ME	3-Chloro-1,2-propanediol	3-MCPD
8607.3-K-ME	(R)-(-)-3-Chloro-1,2-propanediol	(R)-3-MCPD
8608.3-K-ME	(S)-(+)-3-Chloro-1,2-propanediol	(S)-3-MCPD
3874.3-K-ME	3-Chloro-1,2-propane-d5-diol	3-MCPD-d5
	<b>3-MCPD-1-monoesters</b>	
8949.19-100-ME	3-Chloro-1,2-propanediol-1-monopalmitate	3-MCPD-1-16:0
8950.19-100-ME	3-Chloro-1,2-propanediol-1-monopalmitoleate	3-MCPD-1-16:1 (9-cis)
8951.21-100-ME	3-Chloro-1,2-propanediol-1-monostearate	3-MCPD-1-18:0
8952.21-100-ME	3-Chloro-1,2-propanediol-1-monooleate	3-MCPD-1-18:1 (9-cis)
8953.21-100-ME	3-Chloro-1,2-propanediol-1-monolinoleate	3-MCPD-1-18:2 (9,12-dicis)
8954.23-100-ME	3-Chloro-1,2-propanediol-1-monoarachidate	3-MCPD-1-20:0
8955.23-100-ME	3-Chloro-1,2-propanediol-1-monogadolenate	3-MCPD-1-20:1 (11-cis)
8956.25-100-ME	3-Chloro-1,2-propanediol-1-monobehenate	3-MCPD-1-22:0
8957.25-100-ME	3-Chloro-1,2-propanediol-1-monoerucidate	3-MCPD-1-22:1 (13-cis)
	<b>3-MCPD-2-monoesters (Please inquire)</b>	
8961.21-100-ME	3-Chloro-1,2-propanediol-2-monooleate	3-MCPD-di18:1
8962.21-100-ME	3-Chloro-1,2-propanediol-2-monolinoleate	3-MCPD-di18:2
	<b>3-MCPD-diesters</b>	
8967.35-100-ME	3-Chloro-1,2-propanediol-dipalmitate	3-MCPD-di16:0
8968.35-100-ME	3-Chloro-1,2-propanediol-dimonopalmitoleate	3-MCPD-di16:1
8969.39-100-ME	3-Chloro-1,2-propanediol-distearate	3-MCPD-di18:0
8970.39-100-ME	3-Chloro-1,2-propanediol-dioleate	3-MCPD-di18:1
8971.39-100-ME	3-Chloro-1,2-propanediol-dilinoate	3-MCPD-di18:2
8972.43-100-ME	3-Chloro-1,2-propanediol-diarachidate	3-MCPD-di20:0
8973.43-100-ME	3-Chloro-1,2-propanediol-digadolenate	3-MCPD-di20:1
8974.47-100-ME	3-Chloro-1,2-propanediol-dibehenate	3-MCPD-di22:0
8975.47-100-ME	3-Chloro-1,2-propanediol-dierucidate	3-MCPD-di22:1
	<b>Labeled MCPD-esters</b>	
8981.19-100-ME	3-Chloro-1,2-propanediol-monopalmitate-d5	3-MCPD-1-16:0-d5
8976.21-100-ME	3-Chloro-1,2-propanediol-1-monostearate-d5	3-MCPD-1-18:0-d5
8977.25-100-ME	3-Chloro-1,2-propanediol-1-monobehenate-d5	3-MCPD-1-22:0-d5
8982.35-100-ME	3-Chloro-1,2-propanediol-dipalmitate-d5	3-MCPD-di16:0-d5
8978.39-100-ME	3-Chloro-1,2-propanediol-distearate-d5	3-MCPD-di18:0-d5
8979.47-100-ME	3-Chloro-1,2-propanediol-dibehenate-d5	3-MCPD-di22:0-d5
	<b>Glycidyl fatty acid esters</b>	
9674.19-10MG	Glycidyl palmitate	glycidyl C16:0
9896.19-10MG	Glycidyl palmitoleate	glycidyl C16:1 (9-cis)
9899.21-10MG	Glycidyl stearate	glycidyl C18:0
9671.21-10MG	Glycidyl oleate	glycidyl C18:1 (9-cis)
9673.21-10MG	Glycidyl linoleate	glycidyl C18:2 (9-cis, 12-cis)
9672.21-10MG	Glycidyl linolenate	glycidyl C18:3 (6-cis, 9-cis, 12-cis)
9897.23-10MG	Glycidyl arachidate	glycidyl C20:0
9900.23-10MG	Glycidyl gondolenate	glycidyl C20:1 (11-cis)
9898.25-10MG	Glycidyl behenate	glycidyl C22:0
9714.3-10MG	Glycidol	
	<b>Labelled Glycidyl fatty acid esters</b>	
9924.19-10MG	Glycidyl palmitate-d31	glycidyl C16:0-d31



Due to the great number of 3-MCPD mono- or di-esters often total 3-MCPD (the underlying alcohol component of all 3-MCPD-esters) is determined by GC-MS. After hydrolysis of the ester the free alcohol can be analysed by GC-MS after being transferred to volatile derivatives using heptafluorobutyrylimidazole, acetone or phenylboronic acid. Chiron provides this volatile derivatives of 3-MCPD.

Chiron No.	Product	Description
	<i>Volatile 3-MCPD derivatives for GC-MS</i>	1000 µg/mL in methanol
8616.11-K-ME	3-Chloropropane-1,2-di(heptafluoro)butyrate	1000 µg/mL in methanol
8617.6-K-ME	4-Chloromethyl-2,2-dimethyl-1,3-dioxolane	1000 µg/mL in methanol
8618.9-K-ME	4-Chloromethyl-2-phenyl-1,3-dioxo-2-borolane	1000 µg/mL in methanol
9343.6-K-ME	(S)-(-)-3-Chloro-1,2-propandiol acetonide	1000 µg/mL in methanol
9340.3-K-ME	Glycerol-d5	1000 µg/mL in methanol

Acrylamide occurs in many processed starchy foods and is of concern as a possible carcinogen. It was first discovered in food in 2002 and its formation is highly temperature dependent.

Chiron No.	Product	Description
	<i>Acrylamide and metabolites</i>	
3875.3-1G	Acrylamide	1 g neat
3876.3-100-ME	Acrylamide-d3	100 µg/mL in methanol
9454.3-100-ME	Acrylamide-d5	100 µg/mL in methanol
8103.3-100-ME	Acrylamide-1-13C	100 µg/mL in methanol
9986.3-10MG	Glycidamide	10 mg neat
9987.8-100-ME	N-Acetyl-S-(carbamoyl-ethyl-d4)-L-cysteine	100 µg/mL in methanol

Furan can be formed from carbohydrates, amino acids and ascorbic acid during food processing. The major precursor is reported to be ascorbic acid which is transformed to furan.

	<i>Furan</i>	
3877.4-1G	Furan	1g neat
3878.4-100-ME	Furan-d4	100 µg/mL in methanol

Stigmastadienes are formed by processing of olive and other vegetable oils. The ISO method 15788-2:2066 describes the analysis for the determination of stigmastadienes in vegetable oils by HPLC.

	<i>Stigmastadienes Calibrant Solutions</i>	
0678.27-K-BM	$\Delta$ 3,5-Cholestadiene Stock solution	1000 µg/mL in tert-butyl methyl ether
0678.27-10-MX	$\Delta$ 3,5-Cholestadiene External standard solution	10 µg/mL in acetonitrile/tert-butyl methyl ether 1:1
0678.27-2-PT	$\Delta$ 3,5-Cholestadiene Internal standard solution	2 µg/mL in petroleum ether
0622.27-K-IO	$\alpha\alpha\alpha$ (20R)-Cholestane Standard solution	1000 µg/mL in isooctane
0622.27-100-IO	$\alpha\alpha\alpha$ (20R)-Cholestane Standard solution	100 µg/mL in isooctane
	<i>Stigmastadienes Reference Materials</i>	
0678.27-100-IO	$\Delta$ 3,5-Cholestadiene	100 µg/mL in isooctane
0686.29-100-IO	$\Delta$ 3,5,22-Stigmastatriene	100 µg/mL in isooctane
0682.28-200-IO	$\Delta$ 3,5-Campestadiene + $\Delta$ 3,5-Stigmastadiene	200 µg/mL in isooctane
0683.29-100-IO	$\Delta$ 5,22-Stigmastadiene	100 µg/mL in isooctane



## PAHs

		EU 15+1	ISO -	ISO 7981.1+2	EPA PAH's	Relative
		2005/108 rec.	15753:2006	WHO/EU		Carcinogenic-/
		2006:Reg. 1881				Genotoxicity
		Certain foods	Vegetable fats/oils	Drinking water		
0711.10	Naphthalene		x		x	0.001
0732.12	Acenaphthene		x		x	0.001
0002.12	Acenaphthylene				x	0.01-0.001
0217.13	Fluorene		x		x	0-0.001
0816.14	Phenanthrene		x		x	0.001
1049.14	Anthracene		x		x	0.01
0260.16	Fluoranthene		x	x	x	0.001-0.01
0235.16	Pyrene		x		x	0-0.001
0309.17	Benzo[c]fluorene	x				
0201.18	Benz[a]anthracene	x	x		x	0.014-0.1
0212.18	Chrysene	x	x		x	0.001-0.1
0035.18	Cyclopenta[cd]pyrene	x				0.012-0.1
0263.20	Benzo[b]fluoranthene	x	x	x	x	0.10-1.0
0264.20	Benzo[j]fluoranthene	x				0.045-0.1
0265.20	Benzo[k]fluoranthene	x	x	x	x	0.037-0.1
0239.20	Benzo[a]pyrene	x	x	x	x	1
0203.22	Dibenzo[a,h]anthracene	x	x		x	0.89-1.0
0222.22	Benzo[ghi]perylene	x	x	x	x	0.012-0.01
0277.22	Indeno[1,2,3-cd]pyrene	x	x	x	x	0.067-0.1
0244.24	Dibenzo[a,e]pyrene	x				1
0242.24	Dibenzo[a,h]pyrene	x				1.0-1.2
0241.24	Dibenzo[a,i]pyrene	x				0.1
0243.24	Dibenzo[a,l]pyrene	x				100
0296.19	5-Methylchrysene	x				+
Number of compounds		15+1	15	6	16	
<b>Chiron products (native):</b>						
Native mixes		S-4589-100-T	S-4469-100-T	S-4062-ASS-5AN	S-4063-100-5T	
					S-4064-10-CY	
					S-4065-10-5AN	
					S-4470-100-T	
Native Kits		9311.16-KIT			1708.16-KIT (solutions) 1959.16-KIT (neat products)	
		S-4522-100-T				
		9 of 15+1				
Chiron products (D- labelled):		EU PAHs	Inquire	Inquire	S-4513-100-5T	

Please inquire for concentrations and volume of single and multi-component solutions.





## Food packaging contaminants



### Recycled fibres

It has been shown that recycled fibres may contain considerable amounts of diisopropylnaphthalene, diisobutylphthalate and benzophenone. 2,3,5-Trimethylnaphthalene has been applied as internal standard.

2102.16-10MG	Diisobutyl phthalate	DIBP	10 mg neat or 1000 µg/mL in isooctane
1126.16-K-IO	2,6-Diisopropylnaphthalene	DIPN	1000 µg/mL in isooctane
2748.13-1G	Benzophenone		1 g neat
0706.13-500-IO	2,3,5-Trimethylnaphthalene	2,3,5-TMN	500 µg/mL in isooctane

### Plasticizers, phthalates and adipates

There are EU-regulations on the content of plasticizers in food as a result of food packaging. Despite of these regulations, high concentrations (with a mean over 200ppm) of plasticizers have been found in the gaskets of lids of food-jars.

1225.12	Diethyl phthalate	DEPH	Available as neat material or isooctane-solution
3049.28	Di-iso-decyl phthalate in mixture with C9-11-branched alkyl o-phthalate, C10 rich	DIDP	Available as neat material or isooctane-solution
9916.26	Di-iso-nonyl phthalate in mixture with C8-10-branched alkyl o-phthalate, C9-rich	DINP	Available as neat material or isooctane-solution
9917.26	Di-iso-nonyl phthalate (C9-alkyl ester isomer mix, mainly one isomer)	DINP	Available as neat material or isooctane-solution
1224.24	Bis(2-ethylhexyl) phthalate	DEHA	Available as neat material or isooctane-solution
8537.16	n-Butyl iso-butyl phthalate (n-Butyl 2-methylpropyl phthalate)		Available as neat material or isooctane-solution
9754.17	n-Butyl n-pentyl phthalate		Available as neat material or isooctane-solution
8539.18	n-Pentyl iso-pentyl phthalate (n-Pentyl 3-methylbutyl phthalate)		Available as neat material or isooctane-solution
9758.20	Iso-pentyl benzyl phthalate (3-Methylbutyl benzyl phthalate)		Available as neat material or isooctane-solution

See BMF 32 for a complete list of available phthalates and adipates and BMF 50 for Mixed Phthalates.

### 2-Ethylhexanoic acid

2-Ethylhexanoic acid (EHA) is widely used in the technical sector as an intermediate for production of paint additives, thickening agents for fuel, stabilizers for silicones etc. 2-Ethylhexanoic acid, defined as an hazardous substance, have been found in baby food and fruit juices filled in glass bottles with twist-off lids.

3879.8-K-ME	2-Ethylhexanoic acid	1000 µg/mL in methanol, 1 mL
3880.8-K-ME	2-Ethylhexanoic acid-d15	1000 µg/mL in methanol, 1 mL

### Ethyl carbamate

The World Health Organization (WHO) has officially labelled ethyl carbamate, a compound produced during yeast fermentation, as a Group 2A carcinogen, ranking it alongside other substances likely to cause cancer in humans.

3885.3-100MG	Ethyl carbamate	100 mg neat
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### Semicarbazide (SEM)

Semicarbazide is a metabolite of nitrofurazone (agricultural drug forbidden in Europe) and is formed by thermal breakdown of azodicarbonamide. The analysis is performed by the transformation to 2-nitrobenzaldehyde.

3881.7-1G	2-Nitrobenzaldehyde	1 g neat
3882.1-100MG	Semicarbazide HCl	100 mg neat
3883.2.100MG	Azodicarbonamide	100 mg neat
3884.6-100MG	Nitrofurazone	100 mg neat

### ITX, Thioxanthenes

Italian authorities have detected baby milk cartons containing Isopropylthioxanthone (ITX). ITX is used in printing inks on milk and fruit juice cartons. ITX is a mixture of two isomers to which US EPA has given a high hazard ranking for environmental effects.

2723.16-100-IO	1,3,4-d3-2-Isopropylthioxanthone	2-ITX-d3	100 µg/mL in isooctane, 1 mL
2723.16-10MG	1,3,4-d3-2-Isopropylthioxanthone	2-ITX-d3	10 mg neat
2722.16-K-IO	2-Isopropylthioxanthone	2-ITX	1000 µg/mL in isooctane, 1 mL
2722.16-10MG	2-Isopropylthioxanthone	2-ITX	10 mg neat
2726.16-K-IO	4-Isopropylthioxanthone	4-ITX	1000 µg/mL in isooctane, 1 mL
2726.16-10MG	4-Isopropylthioxanthone	4-ITX	10mg neat
3583.13-K-IO	Thioxanthone		1000 µg/mL in isooctane, 1 mL
3586.10-K-IO	6-Methylthiochroman-4-one		1000 µg/mL in isooctane, 1 mL
3587.13-K-IO	2-Chlorothioxanthone		1000 µg/mL in isooctane, 1 mL
3584.17-K-IO	2,4-Diethylthioxanthone	2,4-DETX	1000 µg/mL in isooctane, 1 mL
3585.30-10MG	Thioxanthone-64		10 mg neat
	<b>Xanthenes</b>		
8018.13-K-IO	Xanthone		1000 µg/mL in isooctane, 1 mL

### Environmental contaminants in food

PCFs (Perfluorinated compounds) including P-PHOS and and PFOA: BMF 20

PCBs: BMF 14

PBDEs, and other Flame retardants: BMF 15

Pesticides: BMF 33 and 34, also see the Chiron 2008 catalogue pages 267-372, available at [www.chiron.no](http://www.chiron.no)

