Chromatography

MACHEREY-NAGEL

NUCLEOSHELL® Bluebird RP 18

Fast analyses under highly aqueous conditions

- Special octadecyl core-shell phase with hydrophilic endcapping
- Suitable for LC/MS due to low bleeding characteristics
- Extremely durable in 100 % aqueous mobile phase

MACHEREY-NAGEL
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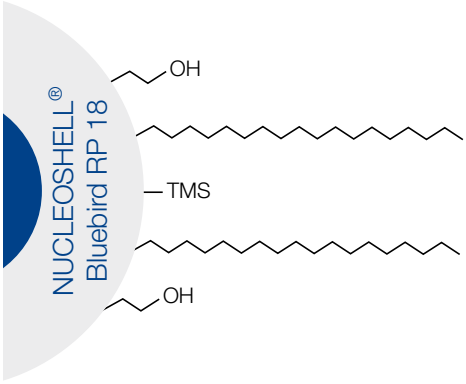
NUCLEOSHELL® Bluebird RP 18

Key features

- Special octadecyl core-shell phase with hydrophilic endcapping
- Distinct polar selectivity
- Extremely durable in 100 % aqueous mobile phase
- Excellent base deactivation
- Suitable for LC/MS due to low bleeding characteristics



Recommended Applications

- Water-soluble vitamins
- Organic acids
- Nitrosamines
- Pesticides
- Sweeteners
- Pharmaceuticals
- Very polar analytes

USP L1

Similar phases: Kinetex® Polar C18

Technical data

Octadecyl modification with polar endcapping on core-shell particles

pH stability:	1–8
Particle size:	2.7 µm (core 1.7 µm)
Pore size:	90 Å
Specific surface:	130 m^2/g
Carbon content:	5 %

Batch-to-batch reproducibility

MN Appl. No. 128610

Chromatographic conditions

Column:	EC 50/4 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763432.40
Eluent:	25 mM ammonium dihydrogen phosphate solution – methanol (35:65, v/v), pH = 7.0
Flow rate:	1.0 mL/min
Temperature:	40 °C
Detection:	UV, 254 nm
Injection:	5 µL

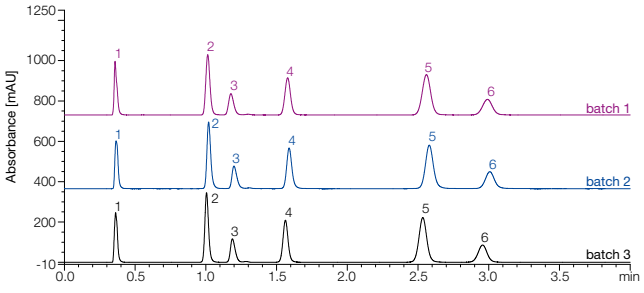
Concentration

Uracil	45 µg/mL
Ethyl benzoate	181 µg/mL
Lidocaine	1134 µg/mL
Naphthalene	1134 µg/mL
Biphenyl	45 µg/mL
Acenaphthene	227 µg/mL

The mixture was diluted to 4 mL with water

Analyte	Peak No.
Uracil	1
Ethyl benzoate	2
Lidocaine	3
Naphthalene	4
Biphenyl	5
Acenaphthene	6

Chromatograms



Excellent reproducibility

High batch-to-batch reproducibility of NUCLEOSHELL® Bluebird RP 18 columns shows reliable results for different LOTs.

NUCLEOSHELL® Bluebird RP 18

Organic acids

MN Appl. No. 128330

Chromatographic conditions

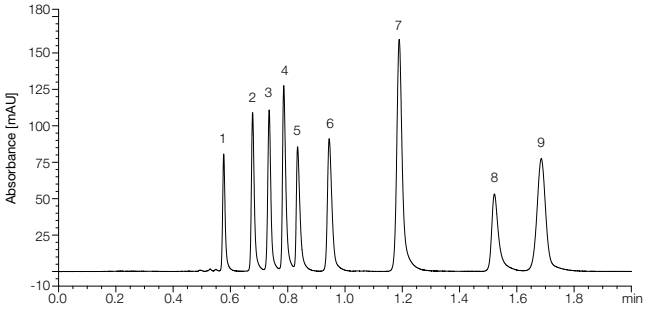
Column: EC 150/4 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF: 763436.40
Eluent: 50 mM potassium dihydrogen phosphate solution, pH = 2.5
Flow rate: 2.0 mL/min
Temperature: 40 °C
Detection: UV, 210 nm
Injection: 3 µL

Concentration (in water)

Tartaric acid	135 µg/mL
Malic acid	2162 µg/mL
Shikimic acid	27 µg/mL
Lactic acid	2703 µg/mL
Acetic acid	2703 µg/mL
Citric acid	1081 µg/mL
Fumaric acid	41 µg/mL
Acrylic acid	676 µg/mL
Arbutin	216 µg/mL

Analyte	Peak No.
Tartaric acid	1
Malic acid	2
Shikimic acid	3
Lactic acid	4
Acetic acid	5
Citric acid	6
Fumaric acid	7
Acrylic acid	8
Arbutin	9

Chromatogram



Enhanced stability

Excellent performance using 100 % aqueous mobile phase.

Polar and non polar substances

MN Appl. No. 128590

Chromatographic conditions

Column: EC 100/2 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
100/2.1 Kinetex® 2.6 µm Polar C18, 100 Å
MN REF: 763434.20
Eluent: 25 mM ammonium dihydrogen phosphate solution – methanol (35:65, v/v), pH = 7.0
Flow rate: 0.66 mL/min
Temperature: 40 °C
Detection: UV, 254 nm
Injection: 5 µL

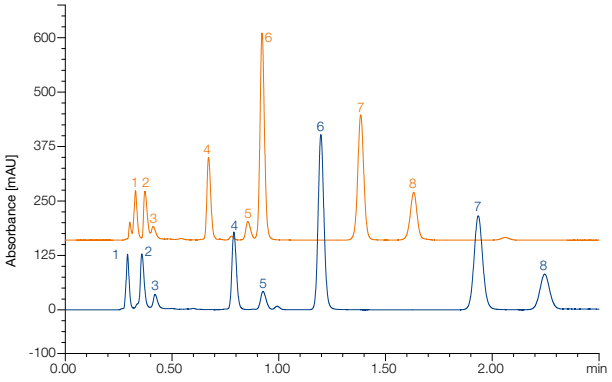
Concentration (in water)

Uracil	45 µg/mL
2,7-DHN	45 µg/mL
2,3-DHN	45 µg/mL
Ethyl benzoate	180 µg/mL
Lidocaine	1123 µg/mL
Naphthalene	1123 µg/mL
Biphenyl	45 µg/mL
Acenaphthene	225 µg/mL

DHN = Dihydroxynaphthalene

Analyte	Peak No.
Uracil	1
2,7-Dihydroxynaphthalene	2
2,3-Dihydroxynaphthalene	3
Ethyl benzoate	4
Lidocaine	5
Naphthalene	6
Biphenyl	7
Acenaphthene	8

Chromatograms



Superior to Kinetex® Polar C18

NUCLEOSHELL® Bluebird RP 18 shows a complete separation of lidocaine, naphthalene and additionally better peak shapes for all analytes compared to Kinetex® Polar C18.

Pesticides

MN Appl. No. 128620

Chromatographic conditions

Column:	EC 50/4.6 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763432.46
Eluent A:	0.1 % formic acid in water
Eluent B:	0.1 % formic acid in methanol
Gradient:	in 5 min from 5 % to 100 % B, hold for 1.0 min, in 0.1 min to 5 % B, hold 5 % B for 3.9 min
Flow rate:	0.7 mL/min
Temperature:	30 °C
Detection:	MS, SMRM
Injection:	20 µL

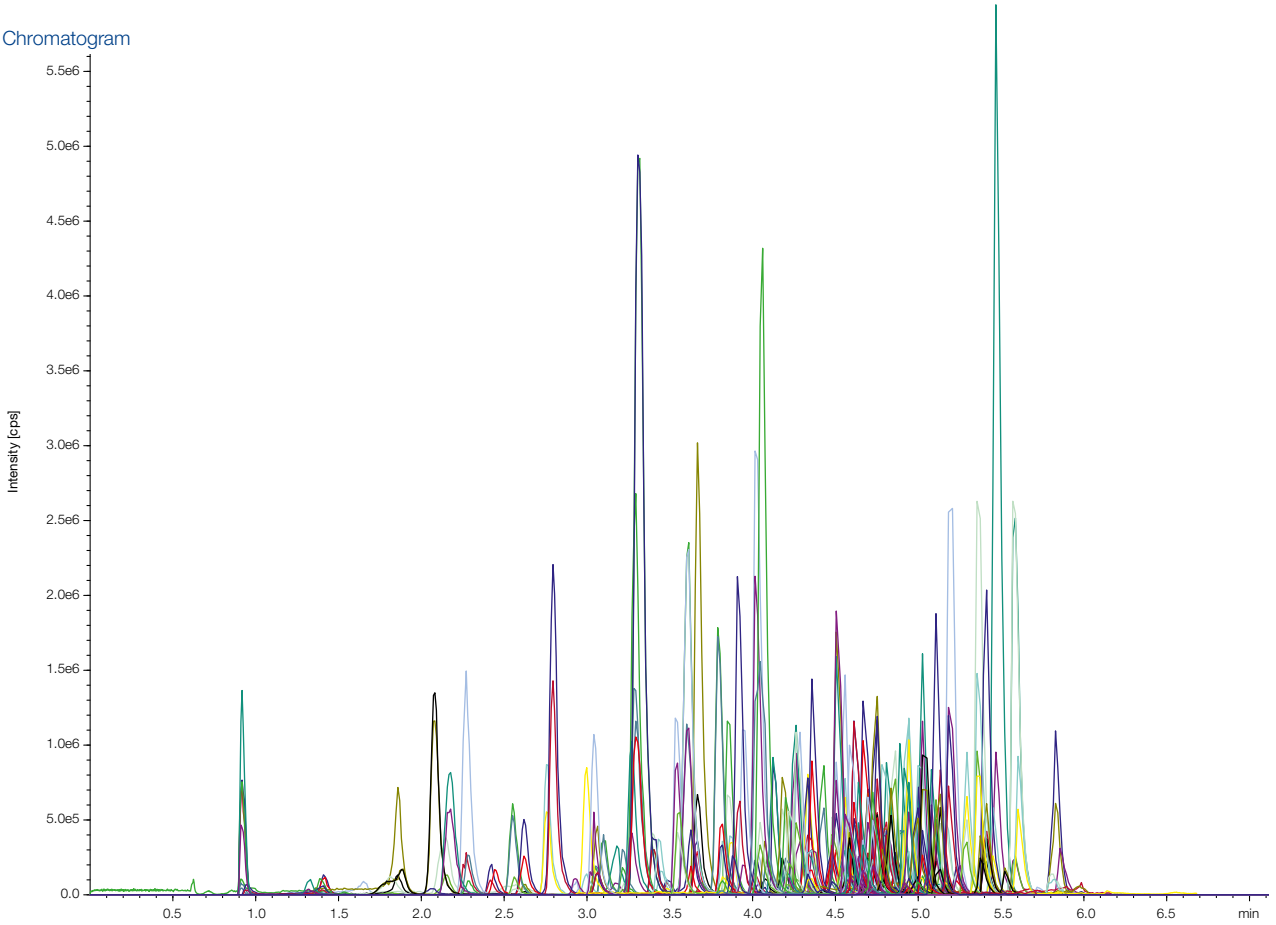
Concentration

2 ng/mL for each analyte in water – acetonitrile (4:1, v/v)

Sample pretreatment according to MN Appl. No. 306590

- Dispersive solid phase extraction (EN 15662)
- QuEChERS Mix I (MN REF 730970) and QuEChERS Mix III (MN REF 730972)
- Sample matrix: red grape

Chromatogram



Retention times

Analyte	RT [min]
Cyromazine	0.95
Propamocarb	1.30
Formetanate HCl	1.36
Aminocarb	1.40
Methamidophos	1.43
Pymetrozine	1.52
Acephate	1.69
Carbendazim	1.84
Nitenpyram	1.84

Analyte	RT [min]
Omethoate	1.93
Dinotefuran	2.09
Mexacarbate	2.13
Thiabendazole	2.19
Aldicarb sulfone	2.20
Fuberidazole	2.29
Oxamyl	2.32
Flonicamid	2.41
Methomyl	2.44

Continued on page 5

Continued from page 4

Analyte	RT [min]
Thiamethoxam	2.56
Ethirimol	2.60
Monocrotophos	2.67
Dicrotophos	2.80
Pirimicarb	2.88
Imidacloprid	2.94
Clothianidin	2.96
Fenuron	3.03
Vamidothion	3.09
3-Hydroxycarbofuran	3.10
Dioxacarb	3.10
Dimethoate	3.17
Acetamiprid	3.18
Imazalil	3.22
Cymoxanil	3.28
Simetryn	3.29
Prometon	3.37
Secbumeton	3.37
Terbumeton	3.39
Thiacloprid	3.43
Mevinphos (Mix of isomers)	3.46
Butocarboxim	3.51
Spiroxamine (Mix of isomers)	3.52
Aldicarb	3.55
Fenpropimorph	3.55
Tricyclazole	3.55
Oxadixyl	3.60
Carbetamide	3.71
Mesotrione	3.71
Ametryn	3.80
Methoprotryne	3.80
Propoxur	3.84
Metribuzin	3.85
Bendiocarb	3.89
Carbofuran	3.89
Thidiazuron	3.92
Tebuthiuron	3.94
Pyracarbolid	3.98
Prometryn	4.03
Terbutryn	4.04
Carbaryl	4.05
Carboxin	4.05
Monolinuron	4.10
Ethiofencarb	4.13
Fluometuron	4.17
Pyrimethanil	4.19

Analyte	RT [min]
Chlorotoluron	4.20
Flutriafol	4.20
Spinosad (Spinosyn A)	4.20
Isoprocarb	4.24
Propham	4.24
Butoxycarboxim	4.28
Methabenzthiazuron	4.28
Metalaxyl	4.29
Isoproturon	4.31
Spinosad (Spinosyn D)	4.32
Isocarbophos	4.33
Spinetoram	4.33
Cycluron	4.34
Hydramethylnon	4.34
Forchlorfenuron	4.35
Chlorantraniliprole	4.41
Bupirimate	4.43
Diethofencarb	4.47
Emamectin B1a benzoate	4.48
Ethiprole	4.48
Metobromuron	4.50
Fenobucarb	4.51
Fenhexamid	4.52
Furalaxyl	4.52
Ethofumesate	4.53
Halofenozide	4.56
Azoxystrobin	4.57
Fenamidone	4.57
Linuron	4.58
Methiocarb	4.59
Carfentrazone-ethyl	4.60
Diuron	4.60
Paclobutrazol	4.60
Siduron	4.60
Promecarb	4.62
Dimethomorph (Mix of isomers)	4.63
Fludioxinil	4.63
Cyprodinil	4.64
Flutolanil	4.64
Myclobutanil	4.64
Triadimenol	4.64
Triadimefon	4.65
Acibenzolar-S-methyl	4.69
Cyproconazole (Mix of isomers)	4.69
Bifenazate	4.70
Bromuconazole (Mix of isomers)	4.70

Continued on page 6

Continued from page 5

Analyte	RT [min]
Clethodim (Mix of isomers)	4.70
Mepronil	4.70
Triticonazole	4.72
Methoxyfenozide	4.73
Chloroxuron	4.74
Mefenacet	4.74
Tetraconazole	4.74
Butafenacil	4.75
Flufenacet	4.76
Spirotetramat	4.76
Iprovalicarb (Mix of isomers)	4.77
Etaconazole (Mix of isomers)	4.78
Fipronil	4.78
Fluoxastrobin	4.80
Epoxiconazole	4.82
Fenbuconazole	4.82
Flusilazole	4.84
Mepanipyrim	4.84
Cyazofamid	4.85
Diflubenzuron	4.85
Prochloraz	4.87
Fenoxycarb	4.91
Neburon	4.93
Dimoxystrobin	4.94
Penconazole	4.94
Rotenone	4.95
Tebuconazole	4.95
Picoxystrobin	4.97
Flubendiamide	4.98
Propiconazole (Mix of isomers)	4.99
Hexaconazole	5.00
Metconazole	5.00
Amitraz	5.01
Benalaxyl	5.03
Triflumizole	5.03
Triflumuron	5.05
Diniconazole	5.09
(Monceren) Pencycuron	5.10
Diclobutrazol	5.10
Etaconazole (Mix of isomers)	5.10
Pyraclostrobin	5.10
Indoxacarb	5.13
Thiobencarb	5.13
Benzoximate	5.16
Clofentezine	5.16
Buprofezin	5.17

Analyte	RT [min]
Ipconazole (Mix of isomers)	5.17
Trifloxystrobin	5.20
Clethodim (Mix of isomers)	5.23
Metaflumizone	5.26
Tebufenpyrad	5.29
Furathiocarb	5.30
Tebufenozide	5.36
Piperonyl butoxide	5.38
Temephos	5.39
Flufenoxuron	5.41
Hexythiazox	5.41
Fenazaquin	5.42
Pyriproxyfen	5.42
Quinoxyfen	5.42
Propargite	5.45
Etoxazole	5.46
Spirodiclofen	5.52
Eprinomectin	5.54
Avermectin B1a	5.57
Fenpyroximate	5.58
Mandipropamid	5.58
Pyridaben	5.60
Doramectin	5.66
Nuarimol	5.66
Moxidectin	5.71
Ivermectin	5.74
Difenoconazole (Mix of isomers)	5.80
Trichlorfon	6.18

Chromatogram on page 4

Fast analyses

LC/MS analysis of more than 190 pesticides in less than 6 minutes on NUCLEOSHELL® Bluebird RP 18.

NUCLEOSHELL® Bluebird RP 18

Water-soluble vitamins

MN Appl. No. 128550

Chromatographic conditions

Column:	EC 50/4.6 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763432.46
Eluent A:	10 mM ammonium formate + 0.1 % formic acid in water
Eluent B:	10 mM ammonium formate + 0.1 % formic acid in methanol
Gradient:	in 2.5 min from 5 % to 95 %, hold for 0.5 min, back to 5 % B in 0.1 min, hold for 1.9 min
Flow rate:	1.3 mL/min
Temperature:	40 °C
Detection:	MS, SMRM
Injection:	5 µL

Concentration

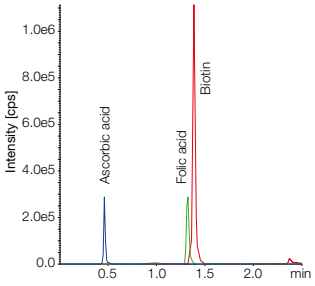
5000 ng/mL for ascorbic acid, 75 ng/mL for all other analytes

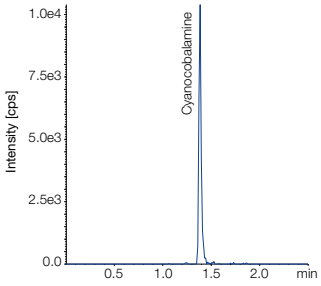
MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Thiamine	0.45	265.1	122.1	144.0
Ascorbic acid	0.46	175.1	86.9	115.0
Pyridoxal	0.53	168.0	150.1	94.2
Pyridoxine	0.54	170.1	152.1	134.0
Nicotinic acid	0.58	124.0	80.1	53.1
Nicotinamide	0.73	123.0	80.0	78.0
Pantothenic acid	0.91	220.1	90.1	201.9
Folic acid	1.32	442.2	295.0	425.3
Biotin	1.38	245.1	226.9	97.1
Cyanocobalamin	1.38	678.5	147.2	359.0
Riboflavin	1.48	377.1	242.9	172.0

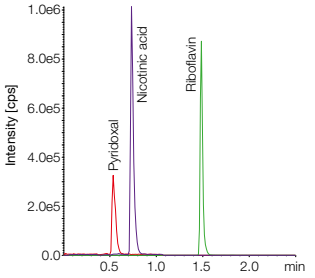
Chromatograms

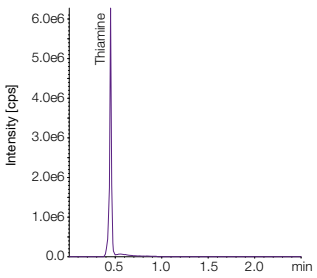
Multivitamin tablet, 100 mg/mL



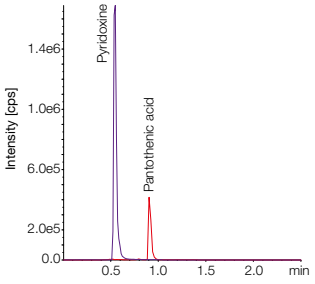


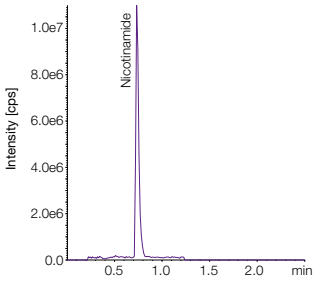
10 times diluted





100 times diluted





THC and its metabolites

MN Appl. No. 128410

Chromatographic conditions

Column: EC 50/4.6 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF: 763432.46
Eluent A: 0.1 % formic acid in water
Eluent B: 0.1 % formic acid in acetonitrile
Gradient: in 2.5 min from 0 % to 90 % B, hold for 0.5 min, in 0.1 min to 0 % B, hold 0 % B for 2.9 min
Flow rate: 1.3 mL/min
Temperature: 40 °C
Detection: MS, SMRM
Injection: 5 µL

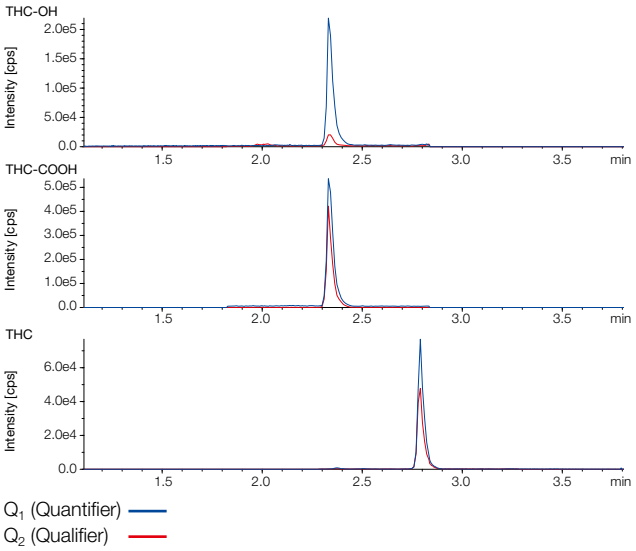
Concentration

50 ng/mL for each analyte

MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
THC-OH	2.33	331.2	99.1	43.1
THC-COOH	2.33	345.2	327.2	299.2
THC	2.79	315.2	193.1	123.1

Chromatograms



Sulfa drugs

MN Appl. No. 128390

Chromatographic conditions

Column: EC 50/4.6 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF: 763432.46
Eluent A: 0.1 % formic acid in water
Eluent B: 0.1 % formic acid in methanol
Gradient: in 4.0 min from 5 % to 20 % B, in 1.0 min to 80 % B, hold 80 % B for 0.5 min, in 0.1 min to 5 % B, hold 5 % B for 4.4 min
Flow rate: 1.3 mL/min
Temperature: 50 °C
Detection: MS, MRM
Injection: 5 µL

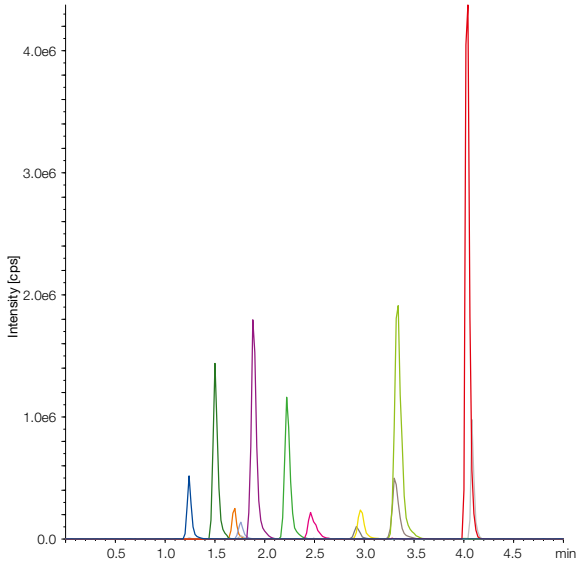
Concentration

100 ng/mL for each analyte

MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Sulfacetamide	1.24	215.2	156.2	92.1
Sulfadiazine	1.50	251.2	156.1	92.1
Sulfapyridine	1.69	250.2	156.1	92.0
Sulfatiazole	1.75	256.2	156.2	92.1
Sulfamerazine	1.89	265.1	156.1	92.1
Sulfadimidine	2.22	279.2	185.9	65.0
Sulfamethoxypyri-dazine	2.46	281.2	156.1	92.2
Sulfamonomethoxine	2.92	281.2	156.1	92.2
Sulfachlorpyridazine	2.96	285.2	156.1	92.1
Sulfamethoxazole	3.31	254.2	156.1	92.1
Sulfadoxine	3.72	311.1	156.1	92.1
Sulfadimethoxine	4.03	311.1	156.1	92.1
Sulfaquinoxaline	4.08	301.2	156.1	92.1

Chromatogram



NUCLEOSHELL® Bluebird RP 18

Sweeteners

MN Appl. No. 128500

Chromatographic conditions

Column:	EC 100/2 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763434.20
Eluent A:	0.1 % formic acid in water
Eluent B:	0.1 % formic acid in methanol
Gradient:	5–95 % B in 4.5 min, hold for 1.0 min, back to 5 % B in 0.1 min, hold for 4.4 min
Flow rate:	0.3 mL/min
Temperature:	40 °C
Detection:	MS, SMRM
Injection:	10 µL

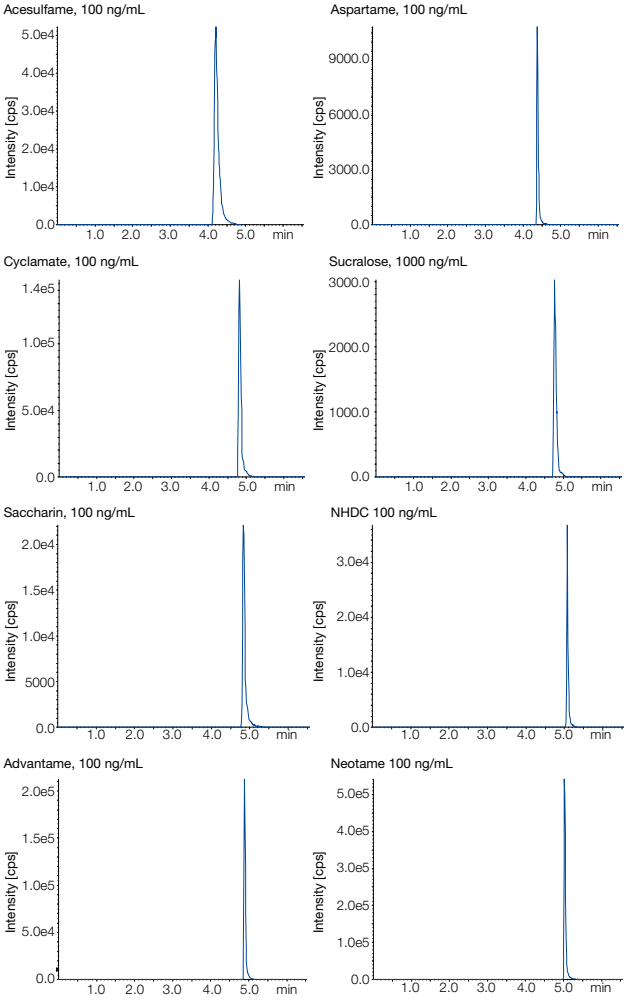
Concentration

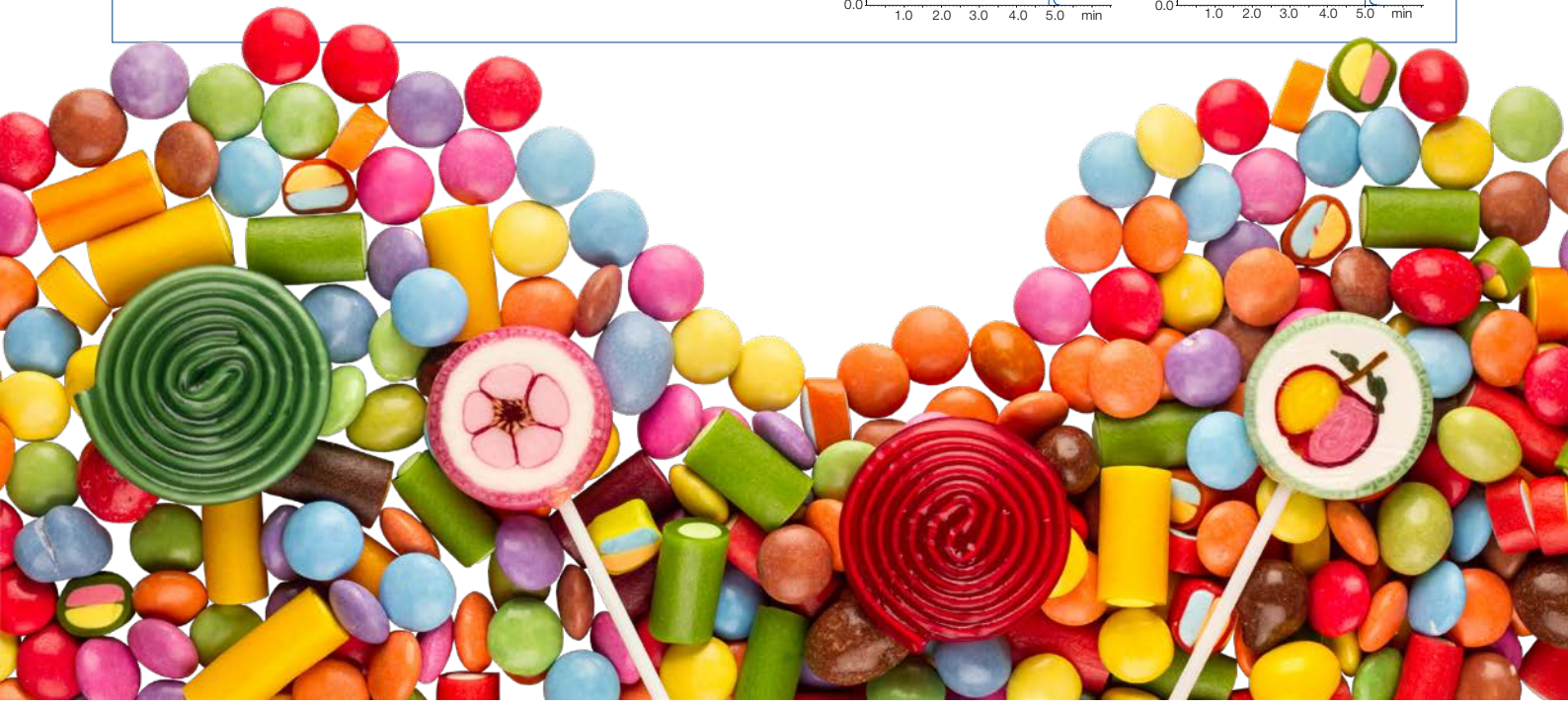
1000 ng/mL for sucralose, 100 ng/mL for all other analytes

MRM transitions

Analyte	Polarity	RT [min]	$[M-H]^-$	Q_1 (Quantifier)	Q_2 (Qualifier)
Acesulfame	negative	4.25	161.9	82.0	77.9
Aspartame	negative	4.38	292.9	146.2	261.3
Cyclamate	negative	4.83	177.9	79.8	80.4
Sucralose	negative	4.83	395.1	178.1	80.0
Saccharin	negative	4.85	181.9	42.2	106.0
NHDC	negative	5.07	611.4	303.3	125.0
Analyte	**Polarity**	**RT [min]**	**$[M+H]^+$**	**Q_1 (Quantifier)**	**Q_2 (Qualifier)**
Advantame	positive	4.98	459.3	102.1	84.1
Neotame	positive	5.12	379.3	172.3	85.2

Chromatograms





Radiocontrast agents

MN Appl. No. 128570

Chromatographic conditions

Column:	EC 100/2 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763434.20
Eluent A:	5 mmol/L ammonium formate + 0.5 % formic acid + 1.0 % acetonitrile in water
Eluent B:	acetonitrile
Gradient:	hold 5 % B for 10.0 min, in 4 min from 5 % to 80 % B, hold for 1.0 min, in 0.1 min to 5 % B, hold 5 % B for 4.9 min
Flow rate:	0.4 mL/min
Temperature:	30 °C
Detection:	MS, MRM
Injection:	20 µL

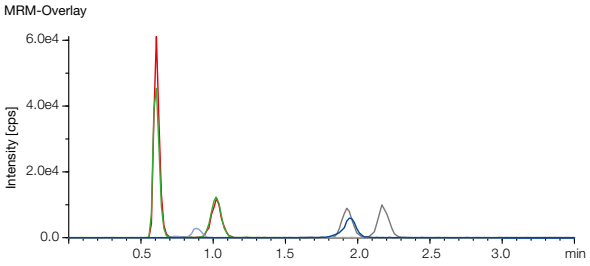
Concentration

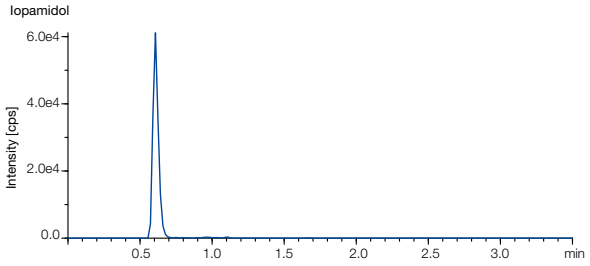
5 ng/mL for each analyte

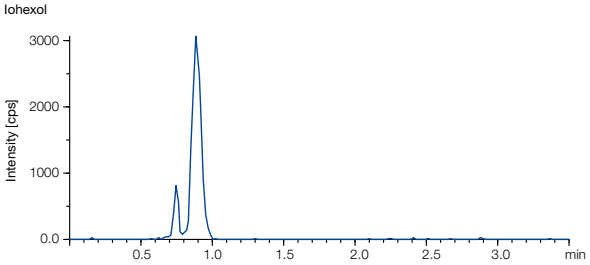
MRM transitions

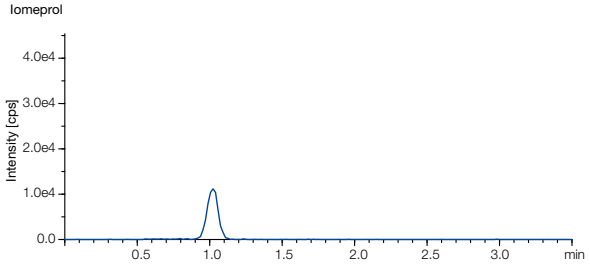
Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Iohexol	0.75/0.88	821.7	528.8	656.8
Iopromide	1.93/2.17	791.8	572.9	558.9
Iopamidol	0.61	777.7	558.9	631.7
Iomeprol	1.01	777.7	686.8	558.8
Diatrizoic acid	1.95	614.7	487.7	579.5

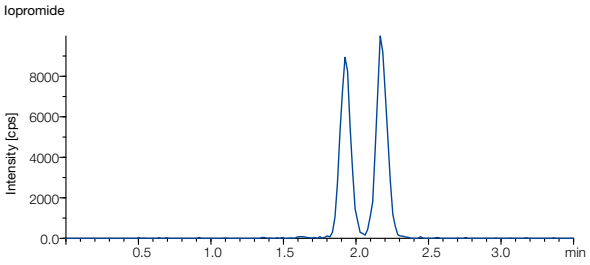
Chromatograms

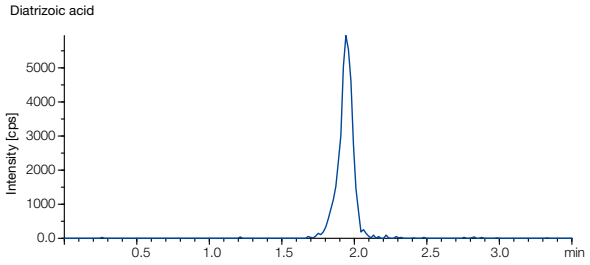












NUCLEOSHELL® Bluebird RP 18

Drug analytes

MN Appl. No. 128340

Chromatographic conditions

Column:	EC 50/4.6 NUCLEOSHELL® Bluebird RP 18, 2.7 µm
MN REF:	763432.46
Eluent A:	0.1 % formic acid in water
Eluent B:	0.1 % formic acid in methanol
Gradient:	in 4.5 min from 5 % to 90 % B, hold for 0.5 min, in 0.5 min to 5 % B, hold 0 % B for 4.5 min
Flow rate:	1.3 mL/min
Temperature:	30 °C
Detection:	MS, SMRM
Injection:	5 µL

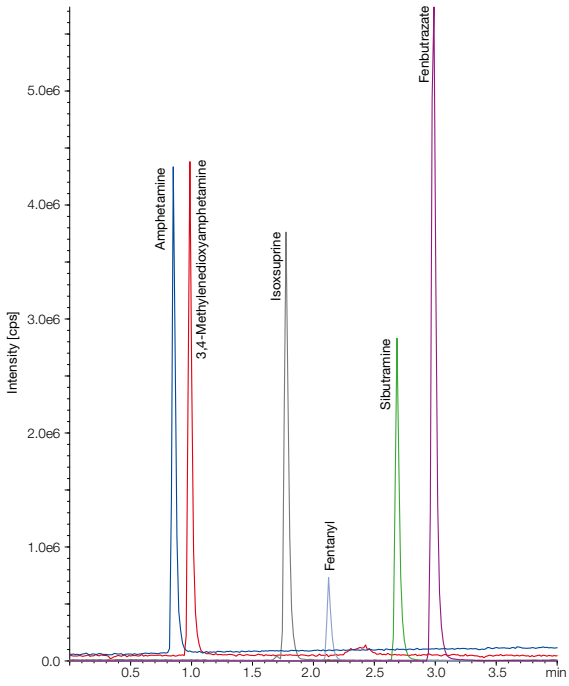
Concentration

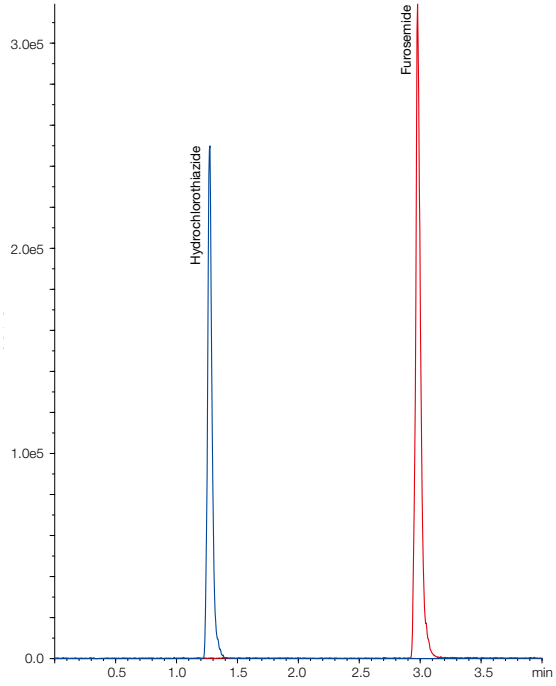
50 ng/mL for each analyte

MRM transitions

Analyte	RT [min]	$[M+H]^+$	Q_1 (Quantifier)	Q_2 (Qualifier)
Amphetamine	0.85	136.0	91.1	108.9
3,4-Methylenedi-oxyamphetamine	0.99	180.0	163.1	105.0
Isoxsuprine	1.78	303.0	285.1	77.1
Fentanyl	2.13	337.0	304.9	105.1
Sibutramine	2.69	280.0	125.0	139.1
Fenbutrazate	2.99	368.2	191.1	91.1
Analyte	**RT [min]**	**$[M-H]^-$**	**Q_1 (Quantifier)**	**Q_2 (Qualifier)**
Hydrochlorothiazide	1.27	295.9	268.7	98.9
Furosemide	2.98	329.0	283.2	255.2

Chromatograms





NUCLEOSHELL® Bluebird RP 18

Ordering information

Length	50 mm	75 mm	100 mm	125 mm	150 mm
NUCLEOSHELL® Bluebird RP 18, 2.7 µm					
EC columns (pack of 1)					
2 mm ID	763432.20	763433.20	763434.20	763435.20	763436.20
3 mm ID	763432.30	763433.30	763434.30	763435.30	763436.30
4 mm ID	763432.40	763433.40	763434.40	763435.40	763436.40
4.6 mm ID	763432.46	763433.46	763434.46	763435.46	763436.46

Selection of guard columns

For EC column with ID of		REF guard column	Required guard column holder (Column protection system)
2 mm	EC 4/2 (pack of 3)	763438.20	718966
3 / 4 / 4.6 mm	EC 4/3 (pack of 3)	763438.30	718966

Registered trademarks

Kinetex® Phenomenex (USA)
NUCLEOSHELL® MACHEREY-NAGEL GmbH & Co. KG (Germany)

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