Restek LC Solutions

Food & Agriculture

Applications and examples for possible separations for Food and Food Safety analysis as well as for the analysis of agricultural products (categorized by compound group)

Acrylamide

- **FFAR3126**   Improve **Acrylamide Analysis in Food** with a Long-Lasting LC Column and a Cost-Effective Internal Standard (Allure Acrylamide, LC-MS/MS) - *meets EN 16618:2015 legislation - overcomes disadvantages of Porous Graphitized Carbon (PGC) columns - enables sufficient and reproducible retention of acrylamide while matrix components can be flushed out more effectively - shorter run time - fast re-equilibration - no time consuming regeneration - analyzing more samples, in less time, with fewer columns*

- **LC_FS0530**   **Acrylamide Extracted from Potato Chips** on Allure Acrylamide (LC-MS/MS) - *with sample preparation per EN 16618:2015*

- **LC_FS0529**   **Acrylamide Reference Standard** (200 ppb) and IS on Allure Acrylamide Column (LC-MS/MS)

Amino Acids

- **FFFA3436**   Fast, Direct Analysis of **Underivatized Amino Acids in Infant Formula** (Raptor Polar X, LC-MS/MS) - *simple, one-step sample preparation - simultaneous analysis of various polarities and functionality of amino acid in a single 10-minute run with isobar resolution and good separation from matrix*

- **LC_FF0539**   **Amino Acids** (9-Fluorenylmethyl-Chloroformate **Derivatives**) on Raptor ARC-18 (LC-UV) - *robust method with FMOC derivatization, also suited for the analysis of glyphosate (derivatized)*

Antibiotics

- **FSSS2276**   Multiclass **Veterinary Antibiotics** on Raptor C18 by LC-MS/MS - *highly efficient peak separation for over 60 antibiotics from different classes on one column in less than 9 minutes*
In addition to that individual class panels were optimized for quantitation: Macrolide, Lincosamide and Streptogramin - Amphenicol and Tetracycline - Quinolone - Penicillin, Cephalosporin and Tetracycline - Sulfonamide - Ionophore (for this individual panel Raptor Biphenyl was used).

- **LC_FS0502**   **Macrolide, Lincosamide, and Streptogramin Antibiotics** on Raptor C18 by LC-MS/MS

- **LC_FS0504**   **Amphenicol and Tetracycline Antibiotics** on Raptor C18 by LC-MS/MS

- **LC_FS0505**   **Quinolone Antibiotics** on Raptor C18 by LC-MS/MS

- **LC_FS0500**   **Penicillin, Cephalosporin, and Tetracycline Antibiotics** on Raptor C18 by LC-MS/MS

- **LC_FS0501**   **Sulfonamide Antibiotics** on Raptor C18 by LC-MS/MS

- **LC_FF0530**   **Sulfur Antibiotics** on Raptor Biphenyl (LC-UV)

- **LC_FS0503**   **Ionophore Antibiotics** on Raptor Biphenyl by LC-MS/MS

- **LC_FS0507**   **Nitrofurans** on Force FluoroPhenyl by UHPLC-MS/MS

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To learn more about these solutions, simply click the linked reference number above.

If you have the printed version and wish to receive the digital copy with links, or are interested in discussing any of the applications mentioned, please contact us at LC-EMEA@restek.com. We are always here to help with all other enquiries, assistance, or to discuss our try-before-you-buy evaluation column policy.

RESTEK   Pure Chromatography   **www.restek.com**

Carbohydrates

- LC_0154   **Sugars** on Ultra Amino (LC-RI) - *classical isocratic mono- and disaccharide analysis with elution of lactose < 15 min*
- LC_0159   **Sugars: Maple Flavored Syrup** on Ultra Amino (LC-RI)

Disinfectants and Preservatives

- LC_PH0531   **Parabens** on Raptor C18 by LC-UV
- LC_FF0623   Benzalkonium Chloride (BAC), Didecyldimethylammonium Chloride (DDAC), Chlorate, Perchlorate on Ultra IBD (LC-MS/MS) - *good retention and separation of several **quaternary ammonium compounds (quats)**, chlorate and perchlorate*

Mycotoxins

- FSAN3903   **Comprehensive Mycotoxin Analysis**: Simultaneous Determination of ***Alternaria* Toxins, Ergot Alkaloid Epimers**, and **Other Major Mycotoxins** in Various **Food** Matrices by LC-MS/MS (Raptor Biphenyl) - *simultaneous determination of Alternaria toxins and ergot alkaloids (complete separation of all six ergot alkaloids and their epimers!) along with other major mycotoxins produced by Aspergillus, Fusarium, and Penicillium fungi - simple sample preparation - fast, 11-minute analysis under low pH condition - rugged method - extended column life time*
- FSFA3905   Analysis of **Ergot Alkaloid Mycotoxins in Blended Flour** by LC-MS/MS Under Acidic Conditions (Raptor Biphenyl) - *baseline separation of six critical ergot alkaloids and their epimers - fast, 11-min total cycle time - acidic conditions, also suitable for the simultaneous analysis of ergot alkaloids, Alternaria toxins, and major regulated mycotoxins (see article FSAN3903)*
- FFSS2790   Highly Selective LC-MS/MS Analysis of **Mycotoxins from Multiple Classes** (Raptor FluoroPhenyl) - *simultaneous determination of 20 mycotoxins, including isobaric separation of 15- and 3-acetyldeoxynivalenol in 9-minute cycle time*
- FFSS2971   5.5 Minute LC-MS/MS Analysis of **Mycotoxins in Peanut Powder** (Raptor Biphenyl) - *separation of 12 FDA-regulated mycotoxins in peanut powder - quick and easy sample preparation*
- LC_FS0527   **Mycotoxins in Brown Rice Flour** on Raptor Biphenyl by LC-MS/MS - *separation of 12 FDA-regulated mycotoxins in brown rice flour - quick and easy sample preparation*
- LC_FS0525   **Mycotoxins in Yellow Corn Meal** on Raptor Biphenyl by LC-MS/MS - *separation of 12 FDA-regulated mycotoxins in yellow corn meal - quick and easy sample preparation*
- LC_FS0524   **Mycotoxins in Unbleached Wheat Flour** on Raptor Biphenyl by LC-MS/MS - *separation of 12 FDA-regulated mycotoxins in unbleached wheat flour - quick and easy sample preparation*
- FFAR3036   **Avoid Mycotoxin Quantitation Errors** When Using Stable Isotope Dilution Assay (SIDA)

For **Aflatoxins and Ochratoxin A in Cannabis CBD Oil, Cannabis Brownies, Cannabis Gummies, Dried Hemp and Chocolate** please request „Restek LC Solutions Cannabis & Hemp".

Organic Acids

- on Ultra Aqueous C18 and Allure Organic Acids - both columns are compatible with 100% aqueous mobile phase

- LC_GN0539   **Volatile Organic Acids** on Ultra Aqueous C18 (LC-UV)
- LC_GN0538   **Organic Acids** on Ultra Aqueous C18 (LC-UV)
- LC_0311   **Organic Acids (Isocitric and Malic)** on Allure Organic Acids (LC-UV)
- LC_0238   **Organic Acids** Standard on Allure Organic Acids (LC-UV)
- LC_0237   **Organic Acids in Grape Juice** on Allure Organic Acids (LC-UV)
- LC_0236   **Organic Acids in Cranberry Juice** on Allure Organic Acids (LC-UV)
- LC_0228   **Carboxylic Acids** on Ultra Aqueous C18 (LC-UV)
- LC_0172   **Tobacco Extract** on Ultra Aqueous C18 (LC-UV)
- LC_0168   **Carboxylic Acids** on Ultra Aqueous C18 (LC-UV)
- LC_0142   **Carboxylic Acids** in 100% Aqueous Mobile Phase on Ultra Aqueous C18 (LC-UV) - *shows retention time stability*
- LC_0140   **Carboxylic Acids** on Ultra Aqueous C18 (LC-UV)

Polycyclic Aromatic Hydrocarbons (PAH)

- LC_FF0514   **EU 15+1 PAH** on Pinnacle II PAH (LC-**FLD**) - *quick ~ 15-minutes analysis on conventional LC (< 400 bar) - baseline separation - THF used as mobile phase additive*
- LC_FF0529   **EU 15+1 PAH** on Pinnacle II PAH (LC-**UV**) - *quick ~ 15-minutes analysis on conventional LC (< 400 bar) - baseline separation - THF used as mobile phase additive*
- LC_FF0513   **EU 15+1 PAH** Mix on Pinnacle DB PAH (LC-UV) - *5-minutes **UHPLC** analysis*

To learn more about these solutions, simply click the linked reference number above.

If you have the printed version and wish to receive the digital copy with links, or are interested in discussing any of the applications mentioned, please contact us at LC-EMEA@restek.com. We are always here to help with all other enquiries, assistance, or to discuss our try-before-you-buy evaluation column policy.

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Pesticides, very polar

- **LC_FS0546** **17 Polar Pesticide Panel** on Raptor Polar X by LC-MS/MS - *panel inspired by European Quick Polar Pesticides (QuPPe) method that includes among others glyphosate, AMPA and glufosinate - no derivatization - short cycle time - fast re-equilibration.*

- **FFPR3743** **QuPPe Method** Now Includes an Approach Using Restek's Raptor Polar X LC Column for LC-MS/MS Analysis of Polar Pesticides - *includes the link to version 12 of the QuPPe-PO method for products of plant origin from the European Reference Labs (EURL) for single residue methods that includes an approach using Restek's Raptor Polar X column for the analysis of a wide range of polar pesticides using LC-MS/MS in negative ESI mode*

- **GNOT3528** Analysis by LC-MS/MS of **polar pesticides in fruits and vegetables** using new hybrid stationary phase (Raptor Polar X) - *Third-Party Publication from University of Almería*

- **FSFA3215** Fast and Rugged Direct Analysis of **Polar Pesticides in Spinach** (Raptor Polar X, LC-MS/MS) - *AMPA, glyphosate and glufosinate well retained and separated without derivatization or ion pairing - good peak shape - high sensitivity - robust column performance for many injections with effective protection by a guard column*

- **LC_FF0621** **Trifluoroacetic Acid (TFA)** on Raptor Polar X (LC-MS/MS)

- **GNSS3195** Raptor Polar X: **Separate a Wide Variety of Polar Analytes with a Novel Hybrid Stationary Phase** (LC-MS/MS) - *brochure with applications and background information on this special phase for polar analytes, which does not require derivatization or ion pairing, can switch between HILIC and anion exchange by simple mobile phase changes, and is quickly re-equilibrated.*

Pesticides

- **LC_FS0522** **LC Multiresidue Pesticide Mix Extracted from Celery** with QuEChERS Slim Pouch on Raptor ARC-18 by LC-MS/MS - *200+ pesticides in < 10 min cycle time (Restek LC multiresidue pesticide kit)*

- **FFSS2930** 7.5-Min Screening Analysis of **Multiresidue Pesticides in Brown Rice Flour** (Raptor ARC-18, LC-MS/MS) - *200+ pesticides in < 10 min cycle time (Restek LC multiresidue pesticide kit) - over 90% of the 200+ residues analyzed exhibit recoveries between 70-120%*

LC Multiresidue Pesticide Kit
204 compounds of interest, formulated and grouped to **ten separate mixes** to ensure **maximum long-term stability and reliability** - *optimized multiresidue pesticide method is offered free of charge - downloadable XLS file includes conditions and transition tables - see below runs for each mix - Raptor ARC-18 is perfect for multi component pesticide screenings with several 100 analytes*

- **LC_FF0543** LC Multi-Residue Pesticide Standard **#1** on Raptor ARC-18 by LC-MS/MS: **Organophosphorus Compounds** (13)
- **LC_FF0544** LC Multi-Residue Pesticide Standard **#2** on Raptor ARC-18 by LC-MS/MS: **Carbamate/Uron Compounds** (16)
- **LC_FF0545** LC Multi-Residue Pesticide Standard **#3** on Raptor ARC-18 by LC-MS/MS: **Carbamate/Uron Compounds** (38)
- **LC_FF0546** LC Multi-Residue Pesticide Standard **#4** on Raptor ARC-18 by LC-MS/MS: **Organonitrogen Compounds** (63)
- **LC_FF0548** LC Multi-Residue Pesticide Standard **#5** on Raptor ARC-18 by LC-MS/MS: **Organonitrogen Compounds** (30)
- **LC_FF0547** LC Multi-Residue Pesticide Standard **#6** on Raptor ARC-18 by LC-MS/MS: **Organonitrogen Compounds** (28)
- **LC_FF0549** LC Multi-Residue Pesticide Standard **#7** on Raptor ARC-18 by LC-MS/MS: **Organonitrogen Compounds** (7)
- **LC_FF0550** LC Multi-Residue Pesticide Standard **#8** on Raptor ARC-18 by LC-MS/MS: **Organonitrogen Compounds** (1)
- **LC_FF0551** LC Multi-Residue Pesticide Standard **#9** on Raptor ARC-18 by LC-MS/MS: **Carbamate/Uron Compounds** (7)
- **LC_FF0552** LC Multi-Residue Pesticide Standard **#10** on Raptor ARC-18 by LC-MS/MS: **Carbamate/Uron Compounds** (1)
- **GNOT3944** Expanding Capabilities in **Multi-Residue Pesticide Analysis** Using the LCMS-8060 (Raptor Biphenyl) - *Third Party publication from Shimadzu and Phytocontrol (France) - they developed a single multi-residue LC-MS/MS method for **646 pesticides** on Raptor Biphenyl*
- **LC_FS0520** **Morpholine Fungicides** on Raptor C18 (LC-MS/MS)
- **EVSS2791** LC-MS/MS Analysis of **Paraquat and Diquat without Ion-Pairing Reagents** (Raptor HILIC-Si) - *robust and sensitive 7-minute HILIC method with good retention and peakshape*
- **LC_GN0696** **Chlormequat, Mepiquat, Paraquat, and Diquat** on Raptor HILIC-Si by LC-MS/MS - *10-minute quats analysis without the need of ion pairing reagents*
- **LC_FF0516** **Pesticide Residue Analysis in Kale** by LC-MS/MS on Ultra Aqueous C18 - *polar modified C18 column for multiclass panels with polar to apolar compounds - also usable with 100% aqueous mobile phase*
- **LC_FF0490** **(259) Pesticides** on Ultra Aqueous C18 (LC-MS/MS) - *polar modified C18 column for multiclass panels with polar to apolar compounds - also usable with 100% aqueous mobile phase*
- **LC_FF0473** **Carbamates** on Ultra Carbamate (LC-MS/MS) - *specialty column for the reversed-phase analysis of Carbamates*
- **LC_FF0472** **Carbamates in Orange Oil** on Ultra Carbamate (LC-MS/MS) - *specialty column for the reversed-phase analysis of Carbamates*

For **Pesticides in Cannabis Brownies, Cannabis Gummies, Dried Hemp and Chocolate** please request „Restek LC Solutions Cannabis & Hemp".

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In-Line Sample Preparation for Multiresidue Pesticide Analysis

- FSSS3549   Revive In-Line Sample Preparation (ILSP): A Faster Approach for **Multiresidue Pesticides in Food** - *brochure about ILSP - automated, in-line sample extract cleanup dramatically reduces sample preparation time - simultaneous analysis and ILSP cartridge wash eliminate downtime between samples - fast, simple alternative to QuEChERS or SPE for multiresidue pesticides analysis in foods*
- FSAR3550   **In-Line Sample Preparation Method Development** - *technical article that details a simple procedure for in-line sample preparation method development, including maintenance and troubleshooting.*

Phytochemicals

- LC_FF0586   **19 Flavonoids** on Raptor Biphenyl by LC-MS/MS

For **Flavonoids in CBG and CBD Hemp Flower**
please request „Restek LC Solutions Cannabis & Hemp".

- LC_FF0557   **Flavonols** on Raptor C18 by LC-MS/MS
- LC_FF0566   Analysis of **Isoflavones** on Force C18 by UHPLC-MS
- LC_FF0556   **Anthocyanidins** on Raptor ARC-18 5µm by HPLC-UV
- LC_FF0554   **Resveratrol and Glucoside Derivative Isomers** on Raptor ARC-18 by LC-MS/MS
- LC_FF0555   **Resveratrol and Glucoside Derivative Isomers Found in Red Wine** on Raptor ARC-18 by LC-MS/MS
- FFAR1522   HPLC Analysis of **Glucosinolates in Vegetable Extracts Without Ion Pairing** Using an Ultra Aqueous C18 Column (LC-UV)
- FFSS3064   Rapid, Simple 4.5-Minute **Pyrrolizidine Alkaloids** Analysis by LC-MS/MS (Raptor ARC-18) - *fast 4.5-min analysis of 10 pyrrolizidine alkaloids - all baseline separated except echimidine and echimidine N-oxide - ARC-18 column lasts longer under acidic conditions than traditional C18 columns - good starting point for further optimization*

Various

- LC_FF0572   **Artificial Sweeteners** on Raptor Biphenyl by LC-MS/MS - *good retention and chromatographic separation due to the special Biphenyl selectivity*
- FFSS2935   Comprehensive LC-MS/MS Analysis of **15 Bisphenols** in 8 Minutes (Raptor Biphenyl 1.8 µm) - *excellent peak shape and chromatographic separation for bisphenol A and common analogues - simple, no-additives mobile phases and gradient program*
- EVSS2395   4-Minute **Bisphenol A (BPA)** Analysis Increases Sample Throughput (Raptor Biphenyl 5µm, LC-MS/MS) - *fast analysis - narrow, symmetrical peak shape - alternate selectivity compared to a C18 allows easier identification in difficult matrices - 5µm compatible with both HPLC and UHPLC systems, low pressure, less risk of blockage*
- FFSS2792   Trace-Level Analysis of **Melamine and Related Compounds** by LC-MS/MS (Raptor HILIC-Si) - *five structural similar food and feed adulterants analysed with 8 min cycle time - excellent sensitivity at 25 ppb*
- FFSS2524   Reliable HILIC LC-MS/MS Analysis of **4-Methylimidazole (4-MEI)** on Raptor FluoroPhenyl Columns - *detection of possible carcinogenic byproduct of caramel food colouring manufacture - increased retention compared to C18 - Raptor FluoroPhenyl columns can be used in both HILIC and reversed-phase modes.*
- LC_FF0531   **Substituted Methoxybenzenes** on Raptor Biphenyl (LC-UV)

Vitamins

- LC_FF0537   **Fat-soluble Vitamins** on Raptor ARC-18 by LC-MS/MS
- LC_FF0558   **Water Soluble Vitamins** by LC-MS/MS (Ultra Aqueous C18)
  - good retention and separation due to the polar modification of the column and the 100% aqueous mobile phase compatibility
- LC_0226   Vitamins **Thiamin (Vitamin B1) and Ascorbic Acid (Vitamin C)** on Ultra Aqueous C18 (LC-UV)
- LC_0227   Vitamins **Thiamin (Vitamin B1) and Ascorbic Acid (Vitamin C)** on Ultra IBD (LC-UV)
- LC_0141   **Vitamins (Water Soluble)** on Ultra Aqueous C18 (LC-UV)

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