



Featured Application: Multiclass Veterinary Antibiotics on Raptor™ C18 by LC-MS/MS

One Analysis, One Column, Less than 9 Minutes for Over 60 Multiclass Antibiotics: The use of antibiotics on food-producing animals is a public health and safety concern due to the potential of generating drug-resistant bacteria. A sensitive, efficient, and reliable analytical method for different classes of antibiotics is necessary to meet regulations covering maximum residue limits (MRL) for a variety of animal tissue and food products. The Raptor™ C18 LC column is the ideal choice.

Analysis of Nicotine and Impurities in Electronic Cigarette Solutions and Vapor

Despite the growing popularity of electronic cigarettes, relatively little work has been done to characterize their vapor. In this study, we developed a quick, simple thermal desorption device for sampling vapor, as well as methods for analyzing vapor and solutions to determine nicotine content (GC-FID) and impurity profiles (GC-MS). This novel approach, which utilizes an Rtx®-VMS column, provides detectable levels of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) from a single 40 mL puff.



Growing Analytical Solutions for Cannabis Testing

Restek has been helping cannabis labs establish innovative, cost-effective analytical solutions from the very beginning. We have the GC and LC products and expertise you need today for analyzing potency, terpenes, residual solvents, and pesticide residues. And we are developing the products you'll need tomorrow for emerging cannabis applications in this fast-growing industry. (PDF - 5367kB)

Analytical Method for Polycyclic Aromatic Hydrocarbons (PAHs) in Yerba Mate Tea Using Modified QuEChERS, Solid Phase Extraction and GC-TOFMS and GC-MS/MS

This application note describes the development of an analytical method for PAHs in tea that allows analysts to more quickly and accurately characterize target PAHs. Sample preparation is based on a modified QuEChERS extraction and solid phase extraction sample cleanup. Both GC-TOFMS and GC-MS/MS techniques were used and analyses were optimized for resolution of isobaric compounds, as well as for maintaining a reasonable analysis time.

High-Quality Analysis of Pesticides in Cannabis Using QuEChERS, Cartridge SPE Cleanup, and GCxGC-TOFMS

As medical marijuana is more frequently prescribed, patient safety must be ensured. Pesticide residue testing is an important part of assuring safe product is dispensed, but analysis can be extremely challenging due to matrix complexity. The use of QuEChERS, cartridge SPE cleanup, and GCxGC-TOFMS as presented here produces high-quality quantitative data for this difficult analysis.

Don't Overestimate Cannabidiol During Medical Cannabis Potency Testing by Gas Chromatography

Proper GC column choice is essential for accurate and robust medical cannabis potency testing. Using an Rxi®-35Sil MS column under the instrument conditions shown here allows fast, accurate reporting of cannabichromene and cannabidiol in medical marijuana samples.

A Fast, Simple FET Headspace GC-FID Technique for Determining Residual Solvents in Cannabis Concentrates

As the cannabis industry expands, demand is increasing for analysis of residual solvents in cannabis concentrates in order to protect consumer safety. This application note details a simple, fast, accurate test for common residual solvents using full evaporation technique headspace GC-FID and an Rxi®-624Sil MS column.

A Preliminary FET Headspace GC-FID Method for Comprehensive Terpene Profiling in Cannabis

This application note describes an FET-HS-GC-FID method that was developed in hops for the analysis of terpenes in cannabis. Good chromatographic separation allowed quantification of critical compounds across the volatility range, including α -pinene, β -myrcene, α -humulene, β -caryophyllene, and caryophyllene oxide.

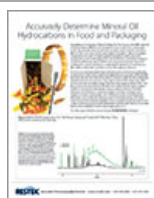
Prepare Olive Oil Samples for Pesticide Residue Analysis in Half the Time With a Fraction of the Solvent Using dSPE

Simplify and speed up sample preparation with Resprep® dSPE tubes! Here we show the extraction and clean-up of pesticide residues from olive oil samples—twice as fast as GPC, with only a fraction of the solvent required for conventional SPE.



Stabilwax®-MS Columns—Thermally Stable, High Polarity GC Columns for Flavor, Food, Fragrance, Industrial Chemical, and Solvent Analyses

Low-bleed Stabilwax®-MS columns produce excellent results for the analysis of trace levels of polar compounds by GC-MS. These columns are ideal for a wide range of polar analytes including FAMES, flavor compounds, essential oils, solvents, aromatics, acrolein/acrylonitrile, and oxygenated compounds. (PDF - 7014kB)



Accurately Determine Mineral Oil Hydrocarbons in Food and Packaging

Accurate testing for mineral oil hydrocarbons (MOHs) in food and packaging is imperative to the safety of our food supply. Turn to Restek for the certified reference materials (CRMs), HPLC columns, GC guard columns, and GC analytical columns you need for world-class analysis of mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH) via online LC/GC coupling. (PDF - 1193kB)



HPLC Analysis of Glucosinolates in Vegetable Extracts without Ion Pairing Using an Ultra Aqueous C18 Column

Glucosinolates with hydrophilic functional groups are very difficult to retain by conventional reversed phase HPLC, and when the functional groups in a sample are diverse, polarity can differ widely, complicating the problem. Until now, reversed phase HPLC with an ion pairing reagent has been the inconvenient, but necessary, approach to these analyses. This 2-page note describes a column and conditions for analyses of glucosinolates, without ion pairing. (PDF - 435kB)

Evaluation of Dispersive and Cartridge Solid Phase Extraction (SPE) Cleanups for Multiresidue Pesticides in QuEChERS Extracts of Finished Tobacco Using GCxGC-TOFMS

We compared the efficacy of dSPE and cSPE cleanup methods for multiresidue pesticide analysis of QuEChERS extracts of finished tobacco products using GCxGC-TOFMS. Cleanup with dSPE tubes containing 7.5 mg of GCB and 25 mg of PSA produced better results than other methods, with average recoveries of 92% and 91% for 500 ppb and 50 ppb fortifications respectively.

Mitigating Matrix Effects: Examination of Dilution, QuEChERS, and Calibration Strategies for LC-MS/MS Analysis of Pesticide Residues in Diverse Food Types

LC-MS/MS is popular for monitoring pesticide residues in food due to its selectivity and sensitivity; however, matrix effects can cause poor data quality and difficult quantification. We evaluated the relative effectiveness of sample dilution, QuEChERS cleanup, solvent-based calibration, and matrix-matched calibration strategies to mitigate matrix effects in celery, kale, avocado, lime, and brown rice flour.



Accurately Detect and Quantify 204 Pesticides of Global Concern by LC-MS/MS with Our New Certified Reference Materials Kit

Stop spending your time and money developing LC-MS/MS multiresidue pesticide methods and mixing reference standards when you could be running samples! Restek's trusted food safety experts have already done the work for you—with guaranteed accuracy and at a lower cost. (PDF - 3066kB)



New Rxi®-PAH GC Column; Resolve Important Isobaric Polycyclic Aromatic Hydrocarbons for Food Safety and Environmental Methods

Separate isobaric polycyclic aromatic hydrocarbons, including priority EFSA PAH4 compounds benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene, easily and accurately on an Rxi®-PAH column. Whether you need more resolution or faster analysis, these new GC columns offer the selectivity and efficiency you need for food safety and environmental PAH analysis. (PDF - 826kB)



QuEChERS Products: Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

Learn how to use the QuEChERS approach to perform faster, easier sample preparation and cleanup for multiresidue pesticide analysis. Q-sep™ QuEChERS products save time, money, and materials compared to modified Luke methods. (PDF - 2874kB)

A Comprehensive Approach to Pesticide Residue Testing, Including Non-Target Analysis, for Fruits, Vegetables, and Nuts, Using QuEChERS, LC-MS/MS, and GCxGC-TOFMS

Food commodities that varied in water, fat, and pigment content were fortified with pesticides and processed using a QuEChERS sample preparation technique. Samples were analyzed by both GCxGC-TOFMS and LC-MS/MS, and good recoveries were obtained for most pesticides in most commodities.

Increase Data Quality for Sulfonamide Residue Analysis by HPLC and UHPLC Using Unique Biphenyl Column Selectivity

The unique selectivity and high retention of Biphenyl columns produce complete separation of sulfonamide residues and benefit both UV and MS detection. In addition, Biphenyl columns in a UHPLC format allow faster sample throughput when testing for these antibiotics.

USLC® Columns Put the Right Tools in Your LC Method Development Toolbox

Column selectivity has the most significant influence on chromatographic peak separation, or resolution, so choosing the right column can greatly speed up HPLC and UHPLC method development. In this article, we discuss column choice and identify a set of just 4 stationary phases—Restek's USLC® column set—that encompasses the widest range of reversed phase selectivity available today.

Comparing Pesticide Residues in Amish and Commercially Grown Strawberries and Spinach Using QuEChERS, Various dSPE Sorbents, and GC-TOFMS

QuEChERS extraction, dSPE cleanup, and GC-TOFMS analysis were used to assess pesticide residue levels in strawberry and spinach from both commercial and Amish growers. Various dSPE sorbent products were compared to determine which were most effective.

Determining Pesticides in Dietary Supplements with QuEChERS Extraction, Cartridge SPE, and GCxGC-TOFMS

The novel approach used here combines QuEChERS extraction, cartridge SPE cleanup, and GCxGC-TOFMS analysis, resulting in good recoveries for a wide range of pesticides in dietary supplements. Matrices include dandelion root, sage, and a multi-herb finished product.



Q-sep™ New Product Supplement

QuEChERS solid phase extraction cartridges. SPE tubes, columns, and reference standards for fast, simple extraction, cleanup, and analysis of pesticide residue samples. Designed for AOAC and European methods. (PDF - 123kB)

Meet New Requirements for Melamine Analysis at 1µg/g in Infant Formula

The recent establishment of a 1µg/g safety threshold for melamine in infant foods has led to an immediate need for more sensitive methods. Here we established GC/MS conditions for highly reproducible analyses and evaluated the effectiveness of both solvent-based and matrix-matched standards. Using this method, melamine and cyanuric acid were reliably detected at and below 1µg/g in infant formula.

Comprehensive Pesticide Residue Analysis by LC-MS/MS Using an Ultra Aqueous C18 Column

Analysis of pesticide residues in foods is complicated by the large number of target compounds. LC-MS/MS analysis using an Aqueous C18 column provides more comprehensive results than GC alone.



Developing New Methods for Pesticides in Dietary Supplements

QuEChERS is a simple, effective approach to sample prep that can be applied to the analysis of pesticides in dietary supplements. Here we demonstrate a QuEChERS, cSPE, GC-TOFMS procedure that results in good recoveries for a wide range of pesticides in dandelion root. (PDF - 5523kB)



Fast, Simple QuEChERS Extraction and Cleanup of Pesticide Residue Samples

QuEChERS dSPE methods simplify extract cleanup, reduce material costs, and improve sample throughput. Here we demonstrate the effectiveness of QuEChERS sample cleanup using a multiresidue analysis of pesticides on strawberries. (PDF - 1180kB)

Using Thermal Desorption to Enhance Aroma Profiling by GC/MS

Thermal desorption offers an automatic, high-sensitivity alternative to conventional liquid extraction methods for aroma profiling by GC/MS. It allows vapor profile constituents to be cleanly separated from the sample matrix and often facilitates selective purging of volatile interferences. This ensures that the vapor profile analyzed is most representative of the aroma perceived by consumers and that key compounds can be identified and measured at the lowest levels possible.

Rapid Screening Method for Carbamates in Orange Oil

EPA Method 531.1 addresses the analysis of carbamate pesticides in water, but not in more complex matrices, which often contain interferences and require time-consuming sample preparation. We developed an easy, accurate screening method for carbamates in a complex matrix using an Ultra Carbamate HPLC column in conjunction with the Leco Unique TOF-MS. This method requires no sample preparation and provides fast analysis times, significantly increasing sample throughput.

High Sensitivity Melamine GC/MS Analysis of Cat Food

Melamine contamination was implicated in a large pet food recall that occurred in 2007 when animals died after eating contaminated pet food. Here, a modified GC/MS method, based on an FDA method, was used to analyze for melamine & related compounds cyanuric acid, ammelide, and ammeline in dry cat food. Analytes were easily identified by retention time matching and mass spectra.

Rapid Characterization of Garlic Volatiles—No Sample Prep Required!

Chromatographic methods for garlic and garlic powder are used by the food and dietary supplement industries to monitor product quality. Here we present a headspace gas chromatography mass spectrometry (HS GC/MS) method for garlic flavor and odor components using an Rxi®-5ms column. This method eliminates sample preparation making the bench work simple and fast. The experimental set-up is ideal for both screening analysis and low-level trace analysis.

Analysis of Nitrofurans in Honey

Nitrofurans are a class of veterinary antibiotics used to increase growth rate and prevent or treat disease in animals. Determining levels of nitrofurans in animal tissue, or even products such as honey, is important in studying drug resistance and allergies in humans. The Ultra C18 HPLC column is an excellent choice for LC-MS/MS analysis of nitrofurans at low levels in complex matrices such as honey. Here we show excellent sensitivity, resolution, and peak shape at trace levels.

Simple, Reliable HPLC Analyses of Organic Acids

Commonly used organic acid methods (e.g. AOAC method 986.13) depend on reversed phase HPLC and C18 columns, however these columns are vulnerable to phase collapse when used with the aqueous mobile phases necessary for optimal organic acid analysis. Restek's Ultra Aqueous C18, Allure® Aqueous C18, and Allure® Organic Acids columns all withstand phase collapse and resolve organic acids in a 100% aqueous mobile phase, compared to a conventional C18 column which shows a complete loss of retention.

Monitor Antioxidants in Tea Extract

An Ultra Aqueous C18 column enables you to use the conditions most effective for this analysis: gradient elution in high aqueous mobile phases. The C18 chains will not collapse in the presence of a high water content. Use this chromatographic system to extract data for specific compounds of interest and to manually inspect spectra for phenolic glycosides, esters of phenolic acid, or other compounds.

Fast, Simple Sample Cleanup

Quick, Easy, Cheap, Effective, Rugged, and Safe, the QuEChERS ("catchers") method for extracting pesticides from food is based on USDA research and employs a novel dispersive solid phase extraction cleanup (dSPE). QuEChERS methods are convenient, rugged methods that simplify extract cleanup, reduce material costs, and improve sample throughput. Here we demonstrate the effectiveness of QuEChERS sample cleanup using a multiresidue analysis of pesticides on strawberries.

Robust 9-Minute GC Analysis of Cholesterol

Conditions are established for analyzing both derivatized and underivatized cholesterol on a highly inert Rxi®-5ms column. Methods described include both an isothermal analysis for use when interferences are minimal, but sample throughput is critical, and a temperature program for use when separation of analytes from contaminants or interfering compounds is the primary concern. Results for both derivatized and underivatized samples were highly reproducible.

Rapid, Reproducible HPLC Analysis for Flavonoids in Cocoa

We separated flavonoids in cacao or cocoa powder samples and returned conditions to the initial mobile

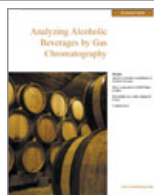
phase composition in 15 minutes. For compounds common to both samples, retention times were equal to within 0.01 seconds. Flavonoid marker compound profiles for 38%, 49%, and 65% cacao were easily distinguished.

[trans Fat: Resolving cis and trans FAME Isomers by GC](#)

The highly polar Rt-2560 stationary phase has the selectivity needed for resolving cis and trans FAME isomers to comply with US FDA food labeling guidelines. Restek reference materials will help you accurately characterize your materials.

[Malachite Green and Leucomalachite Green Analysis](#)

Illegal use of malachite green (MG), an inexpensive fungicide, can allow MG to enter water cycles, where it is easily absorbed by fish tissue, and thus enters the human food supply. Reversed phase HPLC often is used to analyze for MG and its stored metabolite, leucomalachite green. Methods that facilitate detection of both compounds are discussed.



[Analyzing Alcoholic Beverages by Gas Chromatography](#)

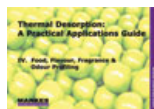
Volatile component profiles of alcoholic beverages reveal a wide range of compounds: acids, alcohols, aldehydes, and others. This 16-page guide describes packed column GC and capillary GC approaches to monitoring these complex mixtures of analytes. A separate section is devoted to detailed information about quantifying trace sulfur compounds in beer. (PDF - 360kB)

[Detecting Illegal Dyes in Foods](#)

Using an Ultra Aqueous C18 column, a simple, isocratic mobile phase, and detection at two UV wavelengths (488nm for Sudan I and II and 520nm for Sudan III and IV), the four dyes are separated and identified in approximately 20 minutes.

[Simple HPLC Analysis for Sudan Dyes](#)

Sudan dyes are illegal as food additives according to the US FDA and the EU. A reversed phase HPLC separation of Sudan I, Sudan II, Sudan III, and Sudan IV (Scarlet Red) is simple, yet efficient, requiring only a simple mobile phase, isocratic elution, and detection at two wavelengths. An Ultra Aqueous C18 column provides the selectivity needed to assure the separation.



[Thermal Desorption: A Practical Applications Guide: IV. Food, Flavour, Fragrance & Odour Profiling](#)

Thermal desorption is used extensively for measuring volatile and semivolatile components in foods, flavors, fragrances, and odors. This 28-page publication from Markes International Ltd. presents several key applications. (PDF - 1952kB)

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