

Q-sep™

QuEChERS Products

Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Speed up sample throughput—4-fold faster than modified Luke methods.
- Reduce solvent usage up to 9-fold, with no chlorinated waste.
- Simultaneously generate samples for GC-MS and LC-MS/MS.

RESTEK Innovative Chromatography

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Save Time and Money with QuEChERS

- Ready-to-use extraction and dSPE tubes, no glassware required.
- Preweighed adsorbents for dSPE cleanup.
- Convenient, method-specific internal and QC standards.

Quick, Easy, Cheap, Effective, Rugged, and Safe, the QuEChERS (“catchers”) method is a fast, simple, and effective alternative to conventional sample prep for multiresidue pesticide analysis. QuEChERS is based on work done by the U.S. Department of Agriculture Eastern Regional Research Center in Wyndmoor, PA.¹ Researchers there were looking for a simple, effective, and inexpensive way to extract and clean pesticide residues from the many varied sample matrices that they worked with routinely. They had been using the modified Luke extraction method, which is highly effective and rugged, but is solvent, labor, and glassware intensive, leading to a relatively high cost per sample. In contrast, QuEChERS employs a very short shake-extraction step, making it faster and less labor intensive. Solid phase extraction cleanup of extracts from other methods also had been effective, but the complex matrices the investigators were dealing with required multiple individual cartridges to remove the many classes of interferences, which added significant cost and complexity to the process. To reduce costs and speed up sample preparation, they developed a novel dispersive solid phase extraction (dSPE) technique, which effectively removes sugars, lipids, organic acids, sterols, proteins, pigments and excess water, but is far simpler and less expensive than conventional methods (Table I).



Using QuEChERS, samples are prepared in three simple steps. As shown on the following page, samples are first homogenized, then extracted and partitioned with an organic solvent and salt solution, with the extracts finally cleaned using the dSPE technique. Using the dSPE approach, the quantity and type of sorbents can easily be optimized for different matrix interferences and difficult analytes. Results from this approach have been verified and modified at several USDA and Food and Drug Administration labs, and the method now is widely accepted for many types of pesticide residue samples. Validation and proficiency data for the QuEChERS method are available for a wide variety of pesticides in several common food matrices at www.quechers.com

Restek Q-sep™ products make QuEChERS even simpler. All extraction salts, adsorbents, and sample tubes are included—no specialized equipment or glassware is required. The dSPE centrifuge tube format, available in 2 mL and 15 mL sizes, contains magnesium sulfate (to partition water from organic solvent) and PSA adsorbent (to remove sugars and fatty acids), with or without graphitized carbon (to remove pigments and sterols) or C18 (to remove nonpolar interferences). Custom products are available by request. If you are frustrated with the time and expense of your current pesticide sample cleanup procedure, we suggest you try this simple, economical new method.

Table I: Prepare samples more quickly, easily, and cost-effectively with QuEChERS.

	Mini-Luke or Modified Luke Method	QuEChERS	Savings with QuEChERS
Estimated time to process 6 samples (min)	120	30	4x faster
Solvent used (mL)	60-90	10	6-9x less solvent
Chlorinated waste (mL)	20-30	0	Safer, cheaper, greener
Glassware/specialized equipment	capacity for 200 mL, quartz wool, funnel, water bath, or evaporator	none	Ready-to-use



Try QuEChERS risk-free today!

Call 1-814-353-1300 or 1-800-356-1688 to request a free sample pack of Q-sep™ QuEChERS tubes.

Quick and Easy...

Prepare Samples for LC or GC Analysis in 3 Simple Steps

1. Blend

Homogenize the sample.



See QuEChERS in Action!

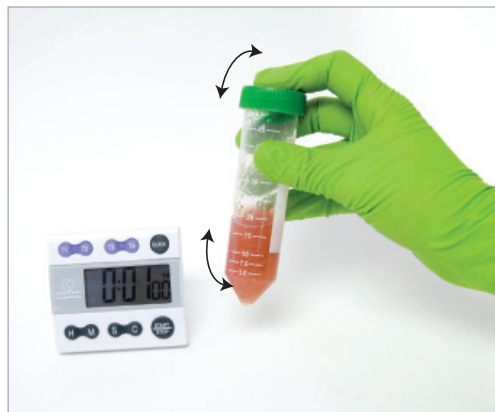


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2. Extract and Dry

Add acetonitrile and internal standard, then shake vigorously for 1 minute.



Add buffering salts and shake, then centrifuge for 5 minutes to separate the phases.

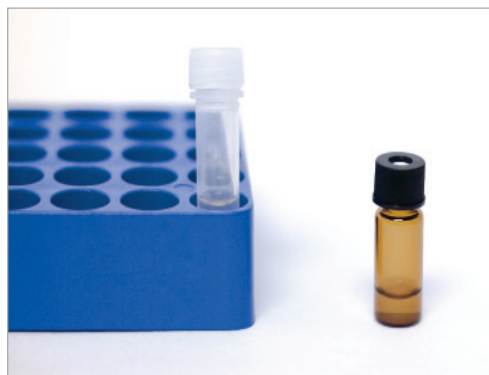


3. Clean Up

Transfer supernatant to dSPE tube.



Shake, centrifuge, and transfer to an autosampler vial for analysis by GC or LC.



QuEChERS dSPE Cleanup Assures Optimal Results for Pesticide Analysis

- Improves integration and mass spectral matches.
- Removes matrix interferences that obscure target analytes or cause ion suppression.
- Protects GC inlet, and LC and GC columns from contamination.

Figure 1: QuEChERS dSPE cleanup removes interferences that obscure target pesticides.

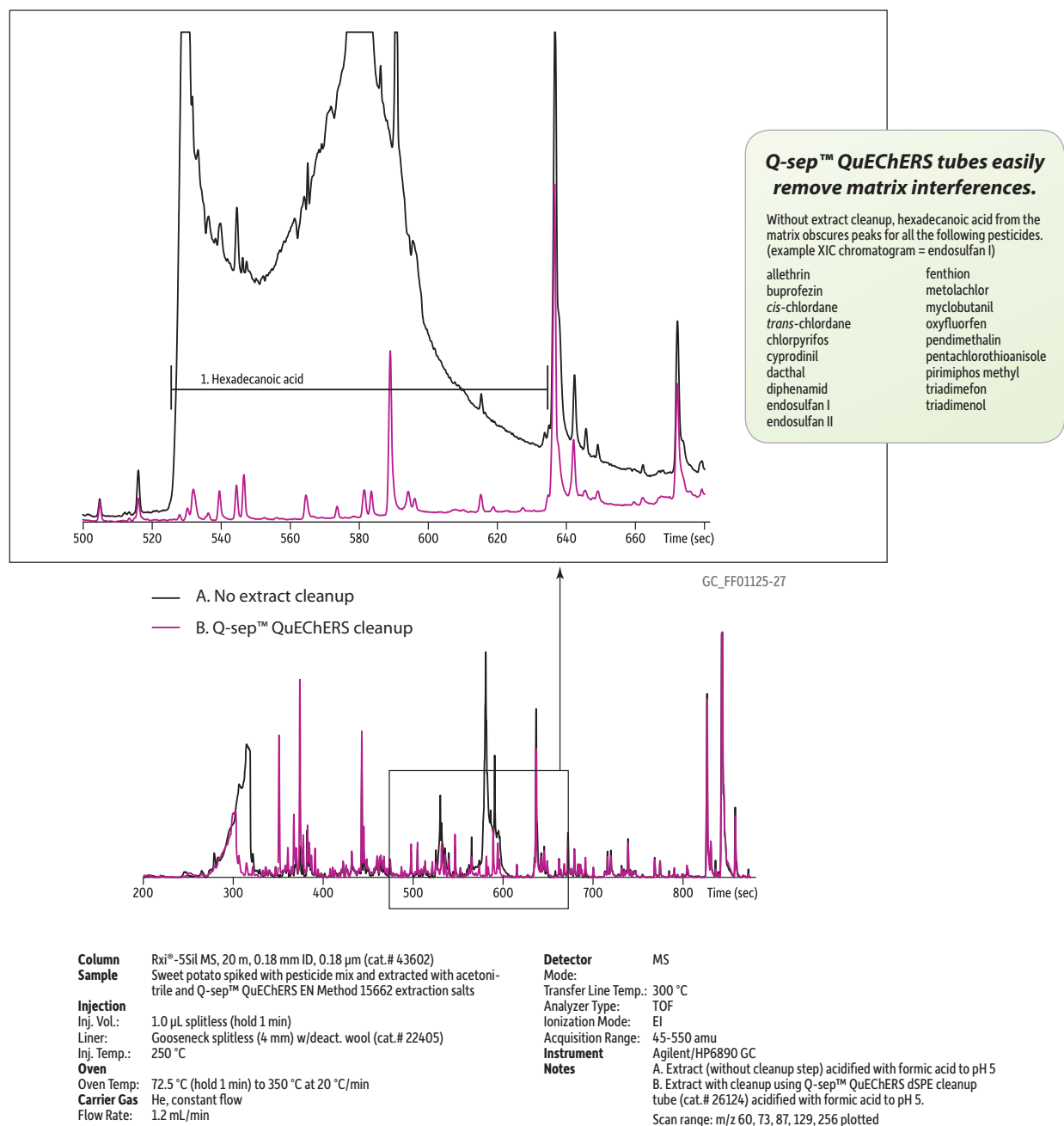
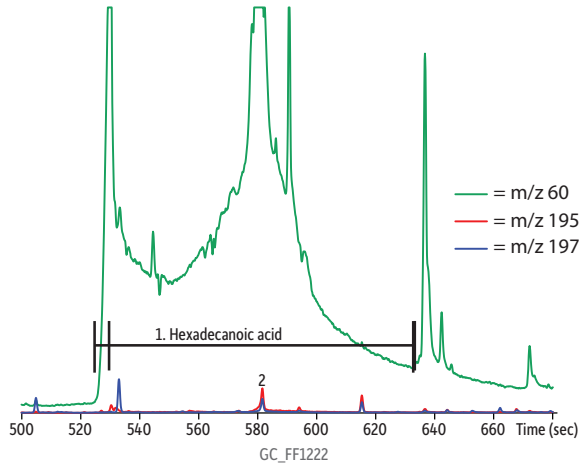


Figure 2: QuEChERS dSPE cleanup significantly improves quantification and identification.

Without cleanup, matrix masks Endosulfan I.



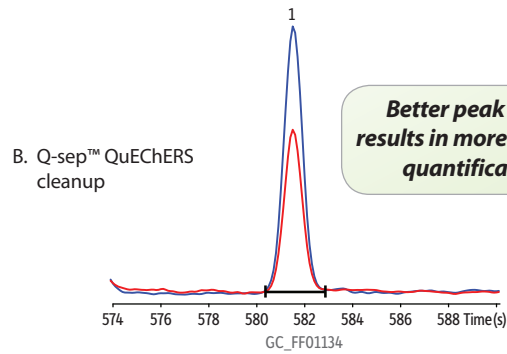
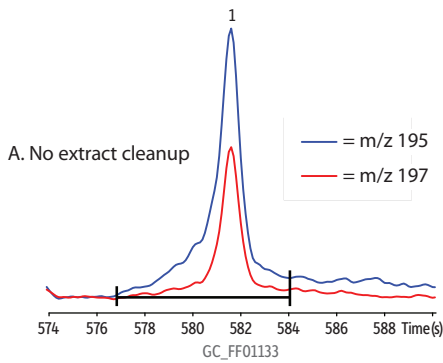
Peak List

1. Hexadecanoic acid
2. Endosulfan I

Column: Rxi[®]-5Sil MS, 20 m, 0.18 mm ID, 0.18 μm (cat.# 43602)
 Sample: sweet potato spiked with pesticide mix, extracted with acetonitrile and Q-sep[™] QuEChERS EN Method 15662 extraction salts, then acidified with formic acid to pH 5
 Inj.: 1.0 μL splitless (hold 1 min.), 4 mm single gooseneck liner with w/wool (cat.# 22405)
 Inj. temp.: 250°C
 Carrier gas: helium, constant flow
 Flow rate: 1.2 mL/min.
 Oven temp.: 72.5°C (hold 1 min.) to 350°C @ 20°C/min.
 Det: TOFMS
 Transfer line temp.: 225°C
 Scan range: 45-550 amu, m/z 60, 195, 197 plotted
 Ionization: EI
 Instrument: Agilent 6890, LECO Pegasus III

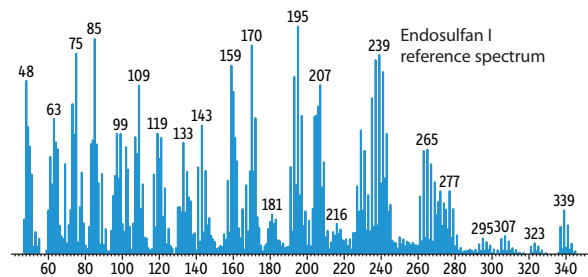
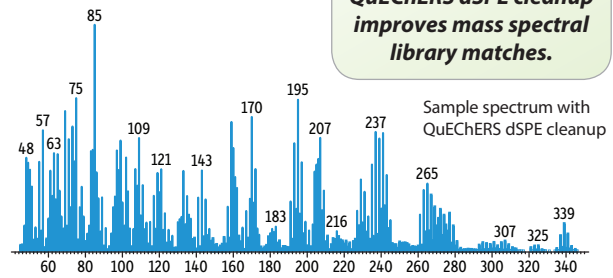
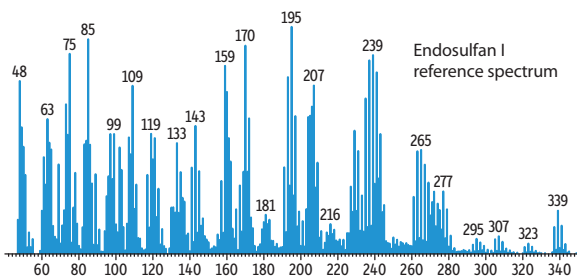
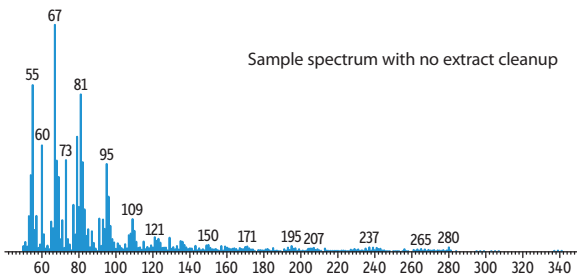
QuEChERS dSPE cleanup improves quantification and identification.

Peak Integration (extracted ion chromatograms)



Better peak shape results in more accurate quantification.

Spectral Identification



QuEChERS dSPE cleanup improves mass spectral library matches.

Optimize Analysis with Sorbent Choice

Choosing a QuEChERS dSPE Sorbent

Primary and secondary amine exchange material (PSA) is the base sorbent used for QuEChERS dSPE cleanup of fruit and vegetable extracts because it removes many organic acids and sugars that might act as instrumental interferences. In addition, C18 or graphitized carbon black (GCB) may be used to remove lipids or pigments, respectively. Choice of sorbent should be based on matrix composition and target analyte chemistry. Most methods make specific recommendations for acidic, basic, and planar pesticides, which may require additional considerations.

As seen in Table II, GCB can have a negative effect on the recoveries of certain pesticides that can assume planar shapes (e.g. chlorothalonil and thiabendazole). The work shown here was done with 50 mg GCB per mL extract, which emphasizes this effect. The EN 15662 QuEChERS method recommends less GCB, which improves recoveries of planar pesticides, but still assures the removal of pigments that can degrade GC-MS performance. To simplify and speed up sample prep, Restek QuEChERS tubes are available in the sorbent combinations and amounts specified by EN 15662 and AOAC methods.

Table II: Select sorbents based on matrix and target analyte chemistry. (Percent recovery using C18 or GCB, relative to PSA alone).

Rt (min)	pesticide	CAS Number	action/use	classification	C18*	GCB**
9.50	dichlorvos	62-73-7	insecticide	organophosphorus	111	116
9.67	methamidophos	10265-92-6	insecticide	organophosphorus	105	107
11.75	mevinphos	7786-34-7	insecticide	organophosphorus	112	130
12.02	o-phenylphenol	90-43-7	fungicide	unclassified	106	97
12.14	acephate	30560-19-1	insecticide	organophosphorus	128	147
13.89	omethoate	1113-02-6	insecticide	organophosphorus	120	119
14.74	diazinon	333-41-5	insecticide	organophosphorus	108	127
14.98	dimethoate	60-51-5	insecticide	organophosphorus	124	151
15.69	chlorothalonil	1897-45-6	fungicide	organochlorine	125	13
15.86	vinclozolin	50471-44-8	fungicide	organochlorine	102	98
16.21	metalaxyl	57837-19-1	fungicide	organonitrogen	105	117
16.28	carbaryl	63-25-2	insecticide	carbamate	114	111
16.60	malathion	121-75-5	insecticide	organophosphorus	124	160
16.67	dichlofluanid	1085-98-9	fungicide	organohalogen	122	103
17.51	thiabendazole	148-79-8	fungicide	organonitrogen	88	14
17.70	captan	133-06-2	fungicide	organochlorine	88	91
17.76	folpet	133-07-3	fungicide	organochlorine	108	63
18.23	imazalil	35554-44-0	fungicide	organonitrogen	115	95
18.39	endrin	72-20-8	insecticide	organochlorine	104	101
18.62	myclobutanil	88671-89-0	fungicide	organonitrogen	119	114
19.07	4,4-DDT	50-29-3	insecticide	organochlorine	102	95
19.22	fenhexamid	126833-17-8	fungicide	organochlorine	118	77
19.40	propargite 1	2312-35-8	acaricide	organosulfur	110	95
19.43	propargite 2	2312-35-8	acaricide	organosulfur	121	114
19.75	bifenthrin	82657-04-3	insecticide	pyrethroid	106	81
20.04	dicofol	115-32-2	acaricide	organochlorine	98	54
20.05	iprodione	36734-19-7	fungicide	organonitrogen	118	90
20.21	fenpropathrin	39515-41-8	insecticide	pyrethroid	113	96
21.32	cis-permethrin	52645-53-1	insecticide	pyrethroid	106	65
21.47	trans-permethrin	51877-74-8	insecticide	pyrethroid	109	71
23.74	deltamethrin	52918-63-5	insecticide	pyrethroid	97	52

*50 mg PSA, 50 mg C18, **50 mg PSA, 50 mg GCB % recovery = $\frac{\text{RRF C18 or GCB}}{\text{RRF PSA}} \times 100$

Strawberry extracts were spiked at 200 ng/mL with pesticides and subjected to dSPE with PSA only. Results were used to generate single point calibration curves. Spiked extracts were then subjected to additional dSPE sorbents (either C18 or GCB). Results are shown as percent recoveries relative to PSA alone.

Sorbent Guide

Sorbent Removes

PSA*	sugars, fatty acids, organic acids, anthocyanine pigments
C18	lipids, nonpolar interferences
GCB**	pigments, sterols, nonpolar interferences

*PSA—primary and secondary amine exchange material

**GCB—graphitized carbon black



Try QuEChERS risk-free today!

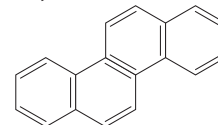
Call 1-814-353-1300 or 1-800-356-1688 to request a free sample pack of Q-sep™ QuEChERS tubes.

Example dSPE Cleanup: PAHs in Infant Formula

Analyzing polycyclic aromatic hydrocarbons (PAHs) in infant formula can be difficult as both the target analytes and certain matrix elements are lipophilic in nature and difficult to separate. Proper sorbent choice is critical to removing matrix interferences, while assuring good PAH recoveries. When choosing a sorbent, target analyte and matrix component chemistry must be considered. PAHs are relatively nonpolar, planar compounds with no pH-dependent functional groups. Infant formula typically contains significant amount of sugars and can be fortified with fatty acids.

Here, PSA was chosen for dSPE cleanup since both sugars and fatty acids can be removed through hydrogen bonding. Using PSA to remove these matrix compounds is optimal, because it will not bind to the relatively nonpolar PAHs, thus ensuring they remain available for analysis. GCB is not recommended here because it also can bind planar PAHs. (Note: GCB is not needed since infant formula does not contain pigments.) Based on the chemical structure of the analytes of interest, as well as the most dominant matrix compounds, PSA is the best choice when analyzing PAHs in infant formula.

Chrysene



Phenanthrene

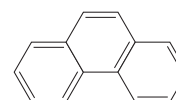
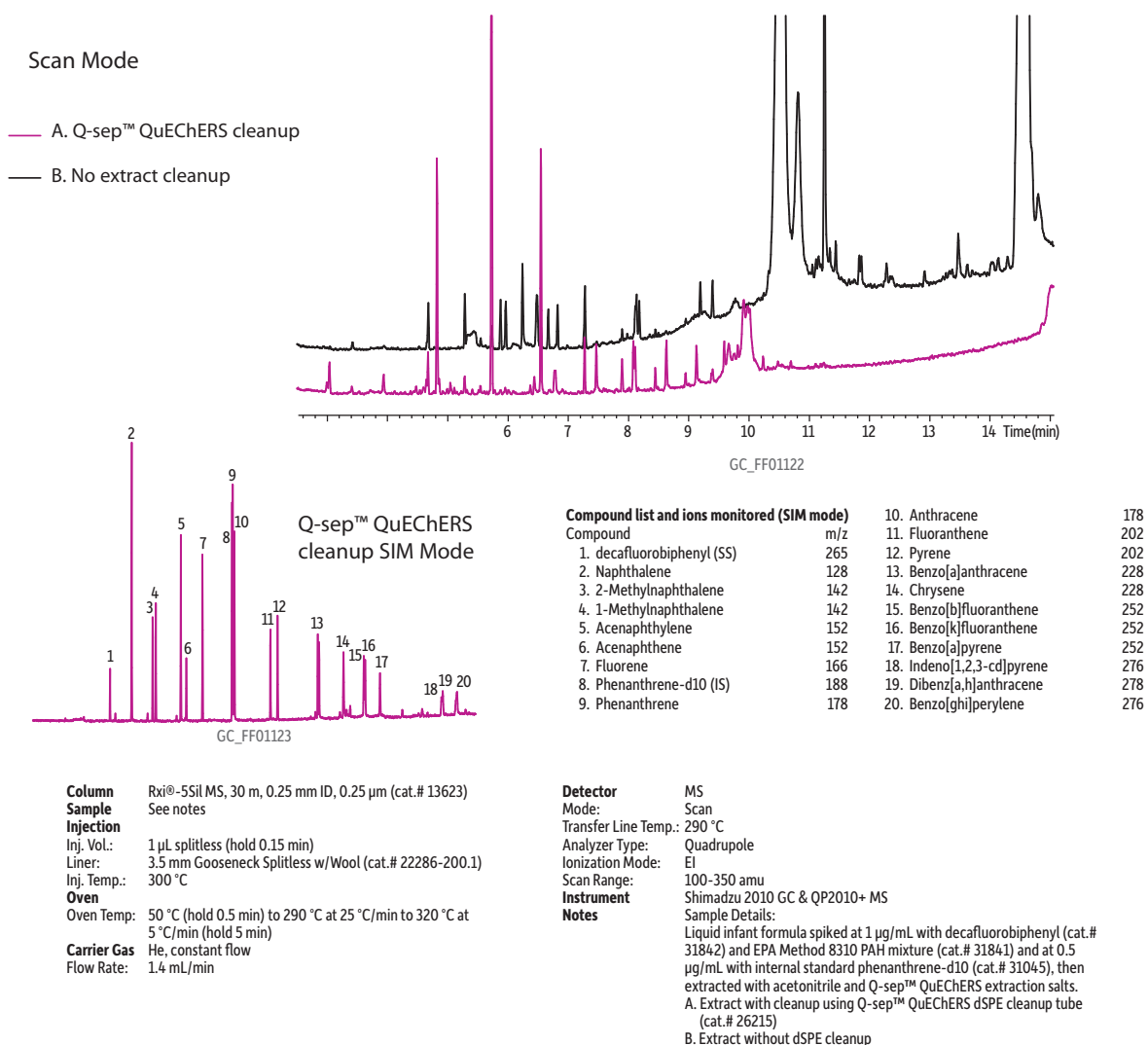


Figure 3: PSA is ideal for removing matrix sugars and fatty acids, while leaving PAHs behind for analysis.



Rugged Technique...

QuEChERS Methods for Complex and Varied Matrices

QuEChERS has been successfully applied to many different types of matrices. When developing procedures for your lab, start with these selected references—or visit www.restek.com/quechers for an expanded version that includes hyperlinks. (Note: references not available from Restek.)

General/Original

1. Fast and Easy Multiresidue Method Employing Acetonitrile Extraction/Partitioning and "Dispersive Solid-Phase Extraction" for the Determination of Pesticide Residues in Produce. (M. Anastassiades, S.J. Lehotay, D. Stajnbaher, F.J. Schenck, J. AOAC International 86 (2003) 412.)
2. QuEChERS—A Mini-Multiresidue Method for the Analysis of Pesticide Residues in Low-Fat Products. (<http://www.quechers.com> (accessed July 15, 2008).)
3. Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate. (AOAC Official Method 2007.01.)
4. Foods of Plant Origin—Determination of Pesticide Residues Using GC-MS and/or LC-MS/MS Following Acetonitrile Extraction/Partitioning and Cleanup by Dispersive SPE (QuEChERS-method). (EN 15662 Version 2008.)

General Fruits and Vegetables

5. Validation of a Fast and Easy Method for the Determination of Residues from 229 Pesticides in Fruits and Vegetables Using Gas and Liquid Chromatography and Mass Spectrometric Detection. (S.J. Lehotay, A. de Kok, M. Hiemstra, P. Van Bodegraven, J. AOAC Int. 88 (2005) 595.)
6. Multiresidue Analysis of 102 Organophosphorus Pesticides in Produce at Parts-Per-Billion Levels Using a Modified QuEChERS Method and Gas Chromatography with Pulsed Flame Photometric Detection. (F. Schenck, J. Wong, C. Lu, J. Li, J.R. Holcomb, L.M. Mitchell, J. AOAC Int. 92 (2009) 561.)

Dairy and Fatty Matrices

7. Evaluation of the QuEChERS Sample Preparation Approach for the Analysis of Pesticide Residues in Olives. (S.C. Cunha, S.J. Lehotay, K. Mastovska, J.O. Fernandes, M. Beatriz, P.P. Oliveira, J. Sep. Sci. 30 (2007) 620.)
8. Dispersive Solid-Phase Extraction Followed by Liquid Chromatography-Tandem Mass Spectrometry for the Multi-Residue Analysis of Pesticides in Raw Bovine Milk. (T. Dagnac, M. Garcia-Chao, P. Pulleiro, C. Garcia-Jares, M. Llompert, J. Chromatogr. A 1216 (2009) 3702.)

Grains, Nuts, and Seeds

9. A Multi-Residue Method for the Determination of 203 Pesticides in Rice Paddies Using Gas Chromatography/Mass Spectrometry. (T.D. Nguyen, E.M. Han, M.S. Seo, S.R. Kim, M.Y. Yun, D.M. Lee, G.H. Lee, Anal. Chim. Acta 619 (2008) 67.)
10. Development of a Multi-Residue Method for the Determination of Pesticides in Cereals and Dry Animal Feed Using Gas Chromatography-Tandem Quadrupole Mass Spectrometry II. Improvement and Extension to New Analytes. (S. Walorczyk, J. Chromatogr. A 1208 (2008) 202.)

Oils

11. Simplified Pesticide Multiresidue Analysis of Soybean Oil by Low-Temperature Cleanup and Dispersive Solid-Phase Extraction Coupled with Gas Chromatography/Mass Spectrometry. (L. Li, Y. Xu, C. Pan, Z. Zhou, S. Jianc, F. Liu, J. AOAC Int. 90 (2007) 1387.)

Baby Food

12. Determination of 142 Pesticides in Fruit- and Vegetable-Based Infant Foods by Liquid Chromatography/Electrospray Ionization-Tandem Mass Spectrometry and Estimation of Measurement Uncertainty. (J. Wang, D. Leung, J. AOAC Int. 92 (2009) 279.)
13. Method for Routine Screening of Pesticides and Metabolites in Meat Based Baby-Food Using Extraction and Gas Chromatography-Mass Spectrometry. (C. Przybylski, C. Segard, J. Sep. Sci. 32 (2009) 1858.)

Non-Food Matrices

14. Multiresidue Analytical Method Using Dispersive Solid-Phase Extraction and Gas Chromatography/Ion Trap Mass Spectrometry to Determine Pharmaceuticals in Whole Blood. (F. Plössl, M. Giera, F. Bracher, J. Chromatogr. A 1135 (2006) 19.)
15. Comparison of Four Extraction Methods for the Analysis of 24 Pesticides in Soil Samples with Gas Chromatography-Mass Spectrometry and Liquid Chromatography-Ion Trap-Mass Spectrometry. (C. Lesueur, M. Gartner, A. Mentler, M. Fuerhacker, Talanta 75 (2008) 284.)

Muscle and Tissues

16. The Development and Validation of a Multiclass Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) Procedure for the Determination of Veterinary Drug Residues in Animal Tissue Using a QuEChERS (QUick, Easy, CHEap, Effective, Rugged and Safe) Approach. (G. Stubbings, T. Bigwood, Anal. Chim. Acta 637 (2009) 68.)

Q-sep™ QuEChERS Products

Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Ready-to-use tubes, no glassware required.
- Preweighed, ultra-pure sorbents.
- Support original unbuffered, AOAC (2007.01) and European (EN 15662) QuEChERS methods.

QuEChERS methods are fast, easy, and cost-effective, and Restek Q-sep™ products make QuEChERS procedures even simpler. All extraction salts, sorbents and sample tubes are included—no specialized equipment or glassware is required. Prepare samples more efficiently with a complete line of QuEChERS supplies from Restek.



Visit www.restek.com/quenchers for new products & detailed technical information.

Q-sep™ QuEChERS Sample Prep Packets & Tubes

Q-sep™ QuEChERS Extraction Salts

- Salt packets eliminate the need for a second empty tube to transfer salts.
- Go green by using packets with reusable tubes.
- Convenient and easy to use.

Description	Material	Methods	qty.	cat#
Q-sep Kit	4 g MgSO ₄ , 1 g NaCl with 50 mL Centrifuge Tube	Original Unbuffered	50 packets & 50 tubes	23991
Q-sep Packets	4 g MgSO ₄ , 1 g NaCl	Original Unbuffered	50 packets	23992
Q-sep Kit	4 g MgSO ₄ , 1 g NaCl, 1 g TSCD, 0.5 g DHS with 50 mL Centrifuge Tube	European EN 15662	50 packets & 50 tubes	26235
Q-sep Packets	4 g MgSO ₄ , 1 g NaCl, 1 g TSCD, 0.5 g DHS	European EN 15662	50 packets	26236
Q-sep Kit	6 g MgSO ₄ , 1.5 g NaOAc with 50 mL Centrifuge Tube	AOAC 2007.01	50 packets & 50 tubes	26237
Q-sep Packets	6 g MgSO ₄ , 1.5 g NaOAc	AOAC 2007.01	50 packets	26238
Empty 50 mL Centrifuge Tube, Polypropylene			50-pk.	26239
Empty 50 mL Centrifuge Tube, FEP			2-pk.	23997

TSCD—trisodium citrate dihydrate; DHS—disodium hydrogen citrate sesquihydrate; NaOAc—sodium acetate



Q-sep™ QuEChERS dSPE Tubes for Extract Cleanup

- Packaged in mylar subpacks for enhanced protection and storage stability.
- Individually labeled tubes for easy sorbent identification.

Description	Methods	qty.	cat#
2 mL Micro-Centrifuge Tubes for dSPE (cleanup of 1 mL extract)			
150 mg MgSO ₄ , 25 mg PSA	Original Unbuffered, Mini-Multiresidue, European EN 15662	100-pk.	26215
150 mg MgSO ₄ , 25 mg PSA, 25 mg C18	Mini-Multiresidue	100-pk.	26216
150 mg MgSO ₄ , 25 mg PSA, 2.5 mg GCB	Mini-Multiresidue, European EN 15662	100-pk.	26217
150 mg MgSO ₄ , 25 mg PSA, 7.5 mg GCB	Mini-Multiresidue, European EN 15662	100-pk.	26218
150 mg MgSO ₄ , 50 mg PSA	AOAC 2007.01	100-pk.	26124
150 mg MgSO ₄ , 50 mg PSA, 50 mg C18	AOAC 2007.01	100-pk.	26125
150 mg MgSO ₄ , 50 mg PSA, 50 mg GCB	AOAC 2007.01	100-pk.	26123
150 mg MgSO ₄ , 50 mg PSA, 50 mg C18, 50 mg GCB	AOAC 2007.01	100-pk.	26219
150 mg MgSO ₄ , 50 mg C18	NA	100-pk.	26242
150 mg MgSO ₄ , 50 mg PSA, 50 mg C18, 7.5 mg GCB	Universal	100-pk.	26243
15 mL Centrifuge Tubes for dSPE (cleanup of 6 mL and 8 mL extract)			
1200 mg MgSO ₄ , 400 mg PSA	AOAC 2007.01	50-pk.	26220
1200 mg MgSO ₄ , 400 mg PSA, 400 mg C18	AOAC 2007.01	50-pk.	26221
1200 mg MgSO ₄ , 400 mg PSA, 400 mg C18, 400 mg GCB	AOAC 2007.01	50-pk.	26222
1200 mg MgSO ₄ , 400 mg C18	similar to AOAC 2007.01	50-pk.	26244
900 mg MgSO ₄ , 150 mg PSA	Original Unbuffered, European EN 15662	50-pk.	26223
900 mg MgSO ₄ , 150 mg PSA, 15 mg GCB	European EN 15662	50-pk.	26224
900 mg MgSO ₄ , 150 mg PSA, 45 mg GCB	European EN 15662	50-pk.	26225
900 mg MgSO ₄ , 150 mg PSA, 150 mg C18	similar to European EN 15662	50-pk.	26226
900 mg MgSO ₄ , 300 mg PSA, 300 mg C18, 45 mg GCB	similar to European EN 15662	50-pk.	26245
900 mg MgSO ₄ , 300 mg PSA, 150 mg GCB	NA	50-pk.	26126

PSA—primary and secondary amine exchange material; GCB—graphitized carbon black



Sorbent Guide

Sorbent	Removes
PSA	sugars, fatty acids, organic acids, anthocyanine pigments
C18	lipids, nonpolar interferences
GCB	pigments, sterols, nonpolar interferences

Q-sep™ Accessories

Q-sep™ Bottle Top Solvent Dispenser



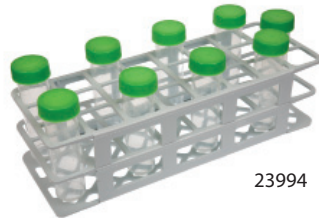
- Adjustment knob offers 56 output volume settings from 2.5 mL to 30 mL per stroke (0.5 mL increments)—ideal for QuEChERS methods!
- Base features 30 mm threads and includes four adaptors (25 mm, 28 mm, 38 mm, and 45 mm).
- Individually calibrated in accordance with ISO 8655 standards (certificate included) and can also be recalibrated by the user.
- PTFE, glass, and polypropylene construction for excellent chemical compatibility and 100% autoclavability.
- Integral safety discharge reduces risk of accidental dispensing and nozzle cap prevents dripping.
- Easy to disassemble for cleaning and servicing.

Accurately and precisely dispense liquids for QuEChERS extractions with this versatile pump. A quick, simple adjustment lets you set the output volume anywhere from 2.5 mL to 30 mL per stroke, and the included adaptors will accommodate most reagent bottles.

Description	qty.	cat.#
Q-sep Bottle Top Solvent Dispenser, 2.5 mL - 30 mL	ea.	23990

Q-sep™ Tube Racks

- Available for 2 mL, 15 mL, and 50 mL tubes.
- Alphanumeric grid reference on top tier for easy identification of samples.
- Easy to assemble, simply fold and snap together securely.



Description	Size	Material	qty.	cat.#
Q-sep Tube Rack for 2 mL Centrifuge Tube	Holds 100	Polypropylene, White	ea.	23995
Q-sep Tube Rack for 15 mL Centrifuge Tube	Holds 60	Polypropylene, White	ea.	23993
Q-sep Tube Rack for 50 mL Centrifuge Tube	Holds 24	Polypropylene, White	ea.	23994

Q-sep™ 3000 Centrifuge

- Meets or exceeds requirements of original unbuffered, AOAC, and European QuEChERS methodology.
- Supports 50 mL, 15 mL, and 2 mL centrifuge tubes.
- Small footprint requires less bench space.
- Safe and reliable—UL, CSA, and CE approved, 1-year warranty.



Centrifuge includes 50 mL tube carriers (6), 50 mL conical tube inserts (6), 4-place 15 mL tube carriers (6), and 2 mL tube adaptors (24).

CE
 Dimensions:
 9" h x 14.5" w x 17" d
 (22.9 cm x 36.8 cm
 x 43.2 cm)

Description	qty.	cat.#
Q-sep 3000 Centrifuge, 110V	ea.	26230
Q-sep 3000 Centrifuge, 220V	ea.	26231
Replacement Accessories		
50 mL Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26232
50 mL Conical Tube Insert for Q-sep 3000 Centrifuge	6-pk.	26249
4-Place Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26233
2 mL Tube Adaptors for Q-sep 3000 Centrifuge	4-pk.	26234

GC and HPLC Columns

Rxi®-5Sil MS Columns (fused silica)

(low polarity Crossbond® silarylene phase; similar to 5% phenyl/95% dimethyl polysiloxane)

- Engineered to be a low bleed GC-MS column.
- Excellent inertness for active compounds.
- Temperature range: -60 °C to 350 °C.

Description	temp. limits	cat.#
20 m, 0.18 mm ID, 0.18 µm	-60 to 330/350 °C	43602
20 m, 0.18 mm ID, 0.36 µm	-60 to 330/350 °C	43604
30 m, 0.25 mm ID, 0.25 µm	-60 to 330/350 °C	13623
30 m, 0.25 mm ID, 0.50 µm	-60 to 330/350 °C	13638

Ultra Aqueous C18 Columns (USP L1)

particle size: 3µm or 5µm, spherical endcap: no
pore size: 100Å pH range: 2.5 to 8
carbon load: 15% temperature limit: 80 °C

Highly retentive and selective for reversed phase separations of polar analytes. Highly base-deactivated. Compatible with highly aqueous (up to 100%) mobile phases.

	Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.2 mm ID cat.#	4.6 mm ID cat.#
3µm Columns	30 mm	9178331	9178332	9178333	9178335
	50 mm	9178351	9178352	9178353	9178355
	100 mm	9178311	9178312	9178313	9178315
	150 mm	9178361	9178362	9178363	9178365
5µm Columns	30 mm	9178531	9178532	9178533	9178535
	50 mm	9178551	9178552	9178553	9178555
	100 mm	9178511	9178512	9178513	9178515
	150 mm	9178561	9178562	9178563	9178565
	200 mm	9178521	9178522	9178523	9178525
	250 mm	9178571	9178572	9178573	9178575

Inlet Liners



For Agilent GCs equipped with split/splitless inlets

23303.1

Sky™ 2.0 mm ID Inlet Liners for Agilent MMI

2.0 mm ID x 6.4 mm x 78.5 mm Length	ea.	5-pk.
Single Taper w/Dimple, Sky Technology, Borosilicate Glass	23334.1	23334.5

Sky™ 4.0 mm ID Single Taper Inlet Liner w/ Wool

4.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.	25-pk.
Single Taper, Sky Technology, Wool	23303.1	23303.5	23303.25

Sky™ 4.0 mm ID Single Taper Inlet Liner

4.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.	25-pk.
Single Taper, Sky Technology	23302.1	23302.5	23302.25

Sky™ 4.0 mm ID Cyclo Double Taper Inlet Liner

4.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.	25-pk.
Cyclo Double Taper, Sky Technology	23310.1	23310.5	23310.25

Sky™ 4.0 mm ID Double Taper Inlet Liner

4.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.	25-pk.
Double Taper, Sky Technology	23308.1	23308.5	23308.25

5.0 mm ID Single Taper Inlet Liner

5.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.
Single Taper, Intermediate Polarity (IP), Borosilicate Glass	22973	22974

5.0 mm ID Single Taper Inlet Liner w/ Wool

5.0 mm ID x 6.5 mm OD x 78.5 mm Length	ea.	5-pk.
Single Taper, Intermediate Polarity (IP), Deact. Wool, Borosilicate Glass	22973-200.1	22974-200.5

QuEChERS Standards

- Ready to use for QuEChERS extractions—no dilutions necessary.
- Support for GC and HPLC with MS, MS/MS, and selective detectors.



QuEChERS Internal Standard Mix for GC-ECD Analysis (4 components)

PCB 18	PCB 52		
PCB 28	tris-(1,3-dichloroisopropyl)phosphate		
50 µg/mL each in acetonitrile, 5 mL/ampul		cat.# 33265 (ea.)	

QuEChERS Internal Standard Mix for GC-MS

PCB 18	50 µg/mL	triphenyl phosphate	20
PCB 28	50	tris-(1,3-dichloroisopropyl)phosphate	50
PCB 52	50	triphenylmethane	10
In acetonitrile, 5 mL/ampul		cat.# 33267 (ea.)	

QuEChERS Internal Standard Mix for GC-NPD and LC-MS/MS Analysis

triphenyl phosphate	20 µg/mL
tris-(1,3-dichloroisopropyl)phosphate	50 µg/mL
In acetonitrile, 5 mL/ampul	
cat.# 33266 (ea.)	

QuEChERS Single-Component Reference Standards

Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
triphenylmethane (5 mL)	519-73-3	ACN	10	33260
triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259

ACN = acetonitrile

QuEChERS Internal Standard Mix for LC-MS/MS Analysis

nicarbazin	
10 µg/mL in acetonitrile, 5 mL/ampul	cat.# 33261 (ea.)

QuEChERS Quality Control Standards for GC-MS Analysis

PCB 138	PCB 153		
50 µg/mL each in acetonitrile, 5 mL/ampul		cat.# 33268 (ea.)	
anthracene			
100 µg/mL in acetonitrile, 5 mL/ampul		cat.# 33264 (ea.)	

AOAC QuEChERS QC Spike Mix (27 components)

40 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 5 mL/ampul	cat.# 31999 (ea.)
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AOAC QuEChERS Triphenylphosphate Solution

triphenylphosphate	
2 µg/mL in acetonitrile:acetic acid (99:1), 5 mL/ampul	cat.# 31964 (ea.)

AOAC QuEChERS IS Solution

α-BHC-d6 (α-HCH-d6)	parathion-d10	
40 µg/mL each in acetonitrile, 5 mL/ampul		cat.# 31963 (ea.)

Selection Guide for Q-sep™ dSPE Tubes

Commodity types and examples	AOAC 2007.01	EN 15662	Mini-multiresidue	Additional products
 <p>Low fat & low pigment fruits & vegetables</p> <ul style="list-style-type: none"> • Celery • Head lettuce • Cucumber • Melon 	<p>2 mL, 100-pk. (cat.# 26124)</p> <p>15 mL, 50-pk. (cat.# 26220)</p>	<p>2 mL, 100-pk. (cat.# 26215)</p> <p>15 mL, 50-pk. (cat.# 26223)</p>	<p>2 mL, 100-pk. (cat.# 26215)</p>	
 <p>Fatty or waxy fruits & vegetables</p> <ul style="list-style-type: none"> • Cereals • Avocado • Nuts & seeds • Dairy 	<p>2 mL, 100-pk. (cat.# 26125)</p> <p>15 mL, 50-pk. (cat.# 26221)</p>		<p>2 mL, 100-pk. (cat.# 26216)</p>	<p>15 mL, 50-pk. (cat.# 26226)</p> <p>2 mL, 100-pk. (cat.# 26242)</p> <p>15 mL, 50-pk. (cat.# 26244)</p>
 <p>Pigmented fruits & vegetables</p> <ul style="list-style-type: none"> • Strawberries • Sweet potatoes • Tomatoes 	<p>15 mL, 50-pk. (cat.# 26222)</p>	<p>2 mL, 100-pk. (cat.# 26217)</p> <p>15 mL, 50-pk. (cat.# 26224)</p>	<p>2 mL, 100-pk. (cat.# 26217)</p>	<p>2 mL, 100-pk. (cat.# 26123)</p>
 <p>Highly pigmented fruits & vegetables</p> <ul style="list-style-type: none"> • Red peppers • Spinach • Blueberries 	<p>2 mL, 100-pk. (cat.# 26219)</p>	<p>2 mL, 100-pk. (cat.# 26218)</p> <p>15 mL, 50-pk. (cat.# 26225)</p>	<p>2 mL, 100-pk. (cat.# 26218)</p>	<p>15 mL, 50-pk. (cat.# 26126)</p>
 <p>Universal use Wide range of commodities, including fatty & pigmented fruits & vegetables.</p>				<p>2 mL, 100-pk. (cat.# 26243)</p> <p>15 mL, 50-pk. (cat.# 26245)</p>
<p>Download free instructions at www.restek.com/quechers</p>	<p>Instruction sheet# 805-01-002</p>	<p>Instruction sheet# 805-01-001</p>	<p>Instruction sheet# 805-01-001</p>	<p>Generic dSPE 805-01-003</p>

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