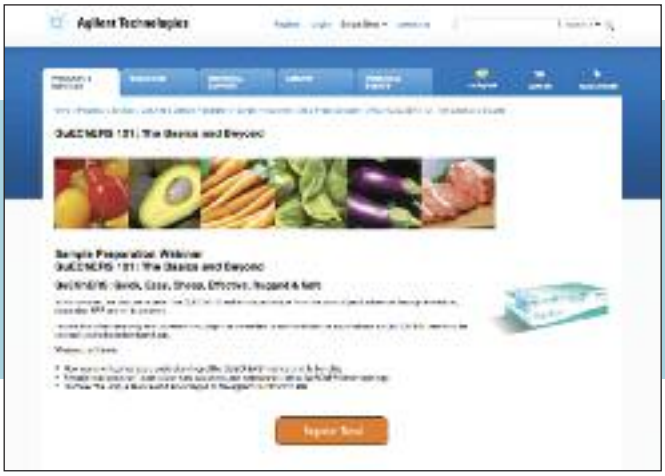
QuEChERS

Agilent Bond Elut QuEChERS Kits make sample prep as easy as 1- 2- 3. Pre-packaged Agilent Bond Elut QuEChERS Kits are an easy way to capture the time-saving benefits of QuEChERS sample preparation.

- Extraction kits with pre-weighed anhydrous salts in sealed packets allow you to add salts after you add organic solvent to your sample – minimizing an exothermic reaction that can compromise analyte recovery
- Dispersive kits with sorbents and salts supplied in 2 mL or 15 mL centrifuge tubes accommodate the aliquot volumes specified by current AOAC and EN methodologies
- Universal dispersive kits provide excellent recoveries and reproducibility for all types of fruits and vegetables
- Ceramic homogenizers break up salt agglomerates, promoting consistent sample extraction and increasing product recovery during extraction and dispersion; shaking time reduced from 60 to 20 seconds

TIPS & TOOLS

For more information on QuEChERS, please view our webinar "QuEChERS 101: The Basics and Beyond" at **www.agilent.com/chem/quecherswebinar**



Agilent Recommended Standard Operating Procedure for QuEChERS

In just 3 easy steps, you can prepare any fruit or vegetable sample for multi-class, multi-residue pesticide analysis.

Comminuted Sample: 10 g or 15 g

Add Acetonitrile

Select Extraction Kit

Original Method 10 g samples	**Original Method** 15 g samples	**Buffered** **AOAC 2007.1 Method** 15 g samples	**Buffered** **EN 15662 Method** 10 g samples

Check pH and adjust to 5 - 5.5
Add internal standard
Shake and centrifuge

Aliquot: 1 mL, 6 mL or 8 mL*

Select Dispersive SPE Kit

General Fruits & Vegetables 2 mL and 15 mL kits	**Fatty/Waxy Fruits & Vegetables** 2 mL and 15 mL kits	**General Fruits & Vegetables** 2 mL and 15 mL kits	**Fatty/Waxy Fruits & Vegetables** 2 mL and 15 mL kits
Pigmented Fruits & Vegetables 2 mL and 15 mL kits	**High Pigment Fruits & Vegetables** 2 mL and 15 mL kits	**Pigmented Fruits & Vegetables** 2 mL and 15 mL kits	**Fruits & Vegetables with Fats, Pigments** 2 mL and 15 mL kits
AOAC Method		**EN Method**	

Shake and centrifuge

Analysis

*Aliquot size is specified by the method, and kits are created for these specific amounts. For pesticides with acidic groups (phenoxyalcanoic acids), analyze directly by LC/MS/MS at this point (skip the dispersive SPE stage). These acidic groups interact with the PSA that is part of the dispersive SPE step.

Selection criteria

- QuEChERS method
- Compounds for screening

Use buffered kits if base-sensitive pesticides are present. Agilent recommends using buffered kits as a first choice.

Selection criteria

- QuEChERS method
- Food type to be analyzed
- Aliquot volume

QuEChERS AOAC 2007.01 extraction kit, 5982-5755

Ceramic homogenizer for 50 mL tubes, 5982-9313

QuEChERS Extraction Kits

- Available with or without 50 mL centrifuge tubes and caps
- Include $MgSO_4$, NaCl, or other salts for buffering; pre-weighed in anhydrous packet

Step 1: Extraction

Choose the extraction salt packet based on your method of analysis, AOAC or EN. The buffered extraction salts are amenable for more labile pesticides. Adding solvent and then salts to a comminuted fruit or vegetable sample (10 g or 15 g) enables you to extract the pesticides of interest into the organic layer. Agilent pre-packages its QuEChERS salts and buffers in anhydrous packages. This allows you to add them after adding your solvent to the sample, as specified in QuEChERS methodologies.

In the table below, the "CH" products contain the appropriately sized CH for those particular kits. For more information on Ceramic Homogenizers see page 99.

QuEChERS Extraction Kits

Method	Buffered	Contents	Ceramic Homogenizers	With 50 mL Tubes 50/pk	Packets Only 50/pk	Packets Only 200/pk
AOAC 2007.01	Yes	6 g $MgSO_4$; 1.5 g NaAcetate	Yes	5982-5755CH		
			No	5982-5755	5982-6755	5982-7755
Original (10 g samples)	No	4 g $MgSO_4$; 1 g NaCl	Yes	5982-5550CH		
			No	5982-5550	5982-6550	5982-7550
Original (15 g samples)	No	6 g $MgSO_4$; 1.5 g NaCl	Yes	5982-5555CH		
			No	5982-5555	5982-6555	5982-7555
EN 15662	Yes	4 g $MgSO_4$; 1 g NaCl; 1 g NaCitrate; 0.5 g disodium citrate sesquihydrate	Yes	5982-5650CH		
			No	5982-5650	5982-6650	5982-7650
Acrylamides*	No	4 g $MgSO_4$; 0.5 g NaCl	No	5982-5850		
Veterinary Drugs**	No	4g Na2SO4, 1 g NaCl	No	5982-0032		

*Katerina Mastovaka and Steven J. Lehotay have done work to extend the scope of QuEChERS beyond fruits and vegetables(1), using it to extract acrylamides in potato chips and other fried foods.

**See Application Note publication number 5991-0013EN: Screening 36 Veterinary Drugs in Animal Origin Food by LC/MS/MS Combined with Modified QuEChERS Method.

1: "Rapid Sample Preparation Method for LC-MS/MS or GC-MS Analysis of Acrylamides in Various Food Matrices", J. Agric. Food Chem, 2006, 54, 7001-7008.

QuEChERS Dispersive Kits

QuEChERS dispersive kit, 5982-5022

QuEChERS dispersive kit, 5982-5022CH

Step 2: Dispersive SPE Cleanup

Select the Dispersive SPE kit suited to the type of food being analyzed and the method you are following. In this step, an aliquot of the sample extract from Step One is added to a 2 mL or 15 mL centrifuge tube containing a small amount of SPE sorbent and $MgSO_4$. The sorbent will pull out interfering matrix materials from the sample, while the $MgSO_4$ helps remove excess water and improve analyte partitioning. Select kits are now available with ceramic homogenizers (2 per tube). Their part numbers are designated by a CH.

QuEChERS Dispersive Kits, Fruits and Vegetables

			AOAC 2007.01 Method	European Method EN 15662
Kit	**Size**	**Unit**	**Kit Contents Part No.**	**Kit Contents Part No.**
General fruits and vegetables: Removes polar organic acids, some sugars and lipids	2 mL	100/pk	50 mg PSA 150 mg $MgSO_4$ 5982-5022 5982-5022CH	25 mg PSA 150 mg $MgSO_4$ 5982-5021 5982-5021CH
	15 mL	50/pk	400 mg PSA 1200 mg $MgSO_4$ 5982-5058 5982-5058CH	150 mg PSA 900 mg $MgSO_4$ 5982-5056 5982-5056CH
Fruits and vegetables with fats and waxes: Removes polar organic acids, some sugars, more lipids and sterols	2 mL	100/pk	50 mg PSA 50 mg C18EC 150 mg $MgSO_4$ 5982-5122 5982-5122CH	25 mg PSA 25 mg C18EC 150 mg $MgSO_4$ 5982-5121 5982-5121CH
	15 mL	50/pk	400 mg PSA 400 mg C18EC 1200 mg $MgSO_4$ 5982-5158 5982-5158CH	150 mg PSA 150 mg C18EC 900 mg $MgSO_4$ 5982-5156 5982-5156CH

Part numbers ending in CH indicate tubes containing ceramic homogenizers.

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QuEChERS Dispersive Kits, Fruits and Vegetables

Kit	Size	Unit	AOAC 2007.01 Method Kit Contents Part No.	European Method EN 15662 Kit Contents Part No.
Pigmented fruits and vegetables: Removes polar organic acids, some sugars and lipids, and carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk	50 mg PSA 50 mg GCB 150 mg $MgSO_4$ 5982-5222 5982-5222CH	25 mg PSA 2.5 mg GCB 150 mg $MgSO_4$ 5982-5221 5982-5221CH
	15 mL	50/pk	400 mg PSA 400 mg GCB 1200 mg $MgSO_4$ 5982-5258 5982-5258CH	150 mg PSA 15 mg GCB 885 mg $MgSO_4$ 5982-5256 5982-5256CH
Highly pigmented fruits and vegetables: Removes polar organic acids, some sugars and lipids, plus high levels of carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk		25 mg PSA 7.5 mg GCB 150 mg $MgSO_4$ 5982-5321 5982-5321CH
	15 mL	50/pk		150 mg PSA 45 mg GCB 855 mg $MgSO_4$ 5982-5356 5982-5356CH
Fruits and vegetables with pigments and fats: Removes polar organic acids, some sugars and lipids, plus carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk	50 mg PSA 50 mg GCB 150 mg $MgSO_4$ 50 mg C18EC 5982-5421 5982-5421CH	
	15 mL	50/pk	400 mg PSA 400 mg GCB 1200 mg $MgSO_4$ 400 mg C18EC 5982-5456 5982-5456CH	

Part numbers ending in CH indicate tubes containing ceramic homogenizers.

QuEChERS Dispersive Kits: Other Food Methods

Kit	Size	Unit	AOAC 2007.01 Method Kit Contents Part No.	European Method EN 15662 Kit Contents Part No.
Other Food Methods Removes biological matrix interferences, including hydrophobic substances (fats, lipids) and proteins	2 mL	100/pk	25 mg C18 150 mg $MgSO_4$ 5982-4921 5982-4921CH	
	15 mL	50/pk	150 mg C18 900 mg $MgSO_4$ 5982-4956 5982-4956CH	
All Food Types Removes all matrix interfering materials including polar organic acids, lipids, sugars, proteins, carotenoids and chlorophyll	2 mL	100/pk	50 mg PSA 50 mg C18 7.5 mg GCB 150 mg $MgSO_4$ 5982-0028 5982-0028CH	
	15 mL	50/pk	400mg PSA 400 mg C18 45 mg GCB 1200 $MgSO_4$ 5982-0029 5982-0029CH	
Animal Origin Food Removes matrix interferences such as polar organic salts, sugars, lipids and proteins	15 mL	50/pk	50 mg PSA 150 mg C18EC 900 mg Na_2SO_4 5982-4950	

Part numbers ending in CH indicate tubes containing ceramic homogenizers.

TIPS & TOOLS

View the core concepts surrounding the QuEChERS method at **www.agilent.com/chem/QuEChERSvideo**

Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Fruits						
 Citrus Fruits	citrus juices					
	grapefruit					
	lemon/lime					
	orange					
	orange peel					
	nectarine					
	tangerine					
 Pome Fruits	apple					
	apple, dried					
	apple sauce					
	apple juice					
	pear					
	quince					
 Stone Fruits	apricot					
	apricot, dried					
	apricot nectar					
	cherry					
	mirabelle					
	nectarine					
	peach					
	peach, dried					
	plum					
	plum, dried					
 Soft and Small Fruits	blackberry					
	blueberry					
	currant					
	elderberry					
	gooseberry, red					
	grapes, red					
	grapes, green					
	raspberry					
	raisin					
	cranberry					
	strawberry					
 Other Fruits	pineapple					
	banana					
	avocado					
	olives					
	fig, dried					
	melon					
	kiwi					
	mango					
	papaya					

(Continued)

Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Vegetables						
 Root and Tuber Vegetables	beets	■				
	carrot	■				
	celeriac	■				
	horseradish	■				
	parsley root	■				
	radish	■				
	black salsify	■				
	potato	■				
 Leek Plants	garlic	■	■			
	onion	■	■			
	scallion	■		■	■	
	leek	■				
	shallot	■				
	chive			■	■	
 Fruiting Vegetables	eggplant/aubergine	■				
	cucumber	■				
	pepper, sweet green			■	■	
	pepper, sweet, red			■	■	
	pumpkin			■		
	tomato	■				
	zucchini (courgette)	■				
 Broccoli	broccoli	■		■		
	brussels sprouts	■				
	cauliflower	■				
	chinese cabbage	■				
	kale			■	■	
	kohlrabi	■				
	red cabbage			■		
	savoy cabbage	■				
	white cabbage	■				
 Leafy Vegetables and Herbs	lettuce varieties	■		■	■	
	endive			■	■	
	cress			■	■	
	lamb's lettuce			■	■	
	cilantro			■	■	
	basil			■	■	
	parsley			■	■	
	rucola, arugula			■	■	
	spinach			■	■	
 Stem Vegetables	asparagus	■				
	celery	■				
	leek	■				
	rhubarb	■		■		
	artichokes	■				
 Legumes	beans, peas, lentils, (fresh)	■		■	■	
	beans, peas, lentils, (dried)	■				

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Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Animal-Sourced Foods						
Meats	beef, pork, veal, chicken					
	liver, kidney					
Seafood	finfish					
	bivalve, shellfish					
Dairy	dairy					
Other Foods						
Cereals	wheat, corn, rice					
	grain, flour, etc.					
Tea/Coffee	coffee beans					
	tea leaves					
Dried Spices	peppercorn seeds					
	peppers, curry					
	leek plants					
Oils	olive, canola					
	citrus					
Baby Food	baby food					
Other						
Agricultural Products	tobacco					
	cotton, hemp					
	cocoa solids					
Soil	soil					
Whole Blood	whole blood					

TIPS & TOOLS

Acccess the complete QuEChERS applications library at **www.agilent.com/chem/QuEChERS**

QuEChERS Ceramic Homogenizers

Ceramic homogenizers increase your overall lab productivity and give you greater confidence in your results. They make analyte extraction easier by:

- Cutting the required extraction time from 60 seconds to as little as 20 seconds – a time savings of 70% per sample
- Maintaining high, reproducible extractions in a third of the time
- Minimizing variance between technicians
- Breaking up salt agglomerates and maintaining a consistent grinding of homogenizing material

The same great ceramic homogenizers available in our QuEChERS Kits are also available for bulk purchase, providing excellent grinding capabilities of the samples.

QuEChERS Ceramic Homogenizers

Description	Unit	Part No.
Ceramic homogenizer for 50 mL tubes	100/pk	5982-9313
Ceramic homogenizer for 15 mL tubes	100/pk	5982-9312
Ceramic homogenizer for 2 mL tubes	200/pk	5982-9311

Ceramic homogenizer for 50 mL tubes, 5982-9313

Standards for QuEChERS Products

In addition to our industry-leading QuEChERS Kits, Agilent makes your analysis easier by providing standards for the most commonly used regulatory methods, including AOAC and EN.

- Save time and avoid inconvenience of making standards
- Available for both GC and LC instruments
- Ready to use for QuEChERS extractions – no dilutions required

Standards for QuEChERS Products

Description	Concentration	Kit Contents	Part No.
HPLC & GC Internal Standard, AOAC Method	1000 µg/mL	Parathion-d10 (diethyl-d10), Alpha-BHC-d6 (alpha-HCH-d6)	5190-0502
QC Solution, AOAC Method	500 µg/mL	Triphenyl phosphate	5190-0503
HPLC Internal Standard, EN Method	100 µg/mL	Tris (1,3-dichloroisopropyl) phosphate, Nicarbazin	5190-0500
GC Internal Standard, EN Method	5000 µg/mL	(2,2'5,5'-tetrachlorobiphenyl), Triphenylmethane, Tris (1,3-dichloroisopropyl) phosphate	5190-0501
QC Surrogate for GC Standard, EN Method	500 µg/mL 1000 µg/mL	(2,2',3,4,4',5'-hexachlorobiphenyl) Anthracene-d10	5190-0499