

Progress in Capillary GC Columns and Inlet Inertness Performance

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Abstract

- Highly sensitive gas phase analyses demand better inertness performance from capillary GC column and flow path components. Active pesticide, basic and acidic analytes all benefit from better inertness performance from the column and the liner.
- Individual column testing for inertness performance is critical in delivering consistent inertness for each and every column. The proof is in the box.
- Limiting activity within the liner is essential in obtaining accurate results. Newer liner deactivation strategies make it possible to analyze pesticides using inlet liners with glass wool.
- The implication for the user of these rigorously tested columns and highly inert liners is better assurance of inertness performance for challenging applications.
- Lower limits of detection, less tailing, and more reliable results are now available even for difficult analytes.

Experimental

Applications using mid polarity Agilent J&W DB-35ms UI capillary GC columns are illustrated. The full version of the application notes can be found at the online Agilent Library.

Matrix matched QC samples were prepared using Agilent's QuEChERS extraction kits. Figure 1 illustrates the QuEChERS sample preparation procedure used for the analysis of pesticides in apple and fish.

QuEChERS Sample Preparation Workflow

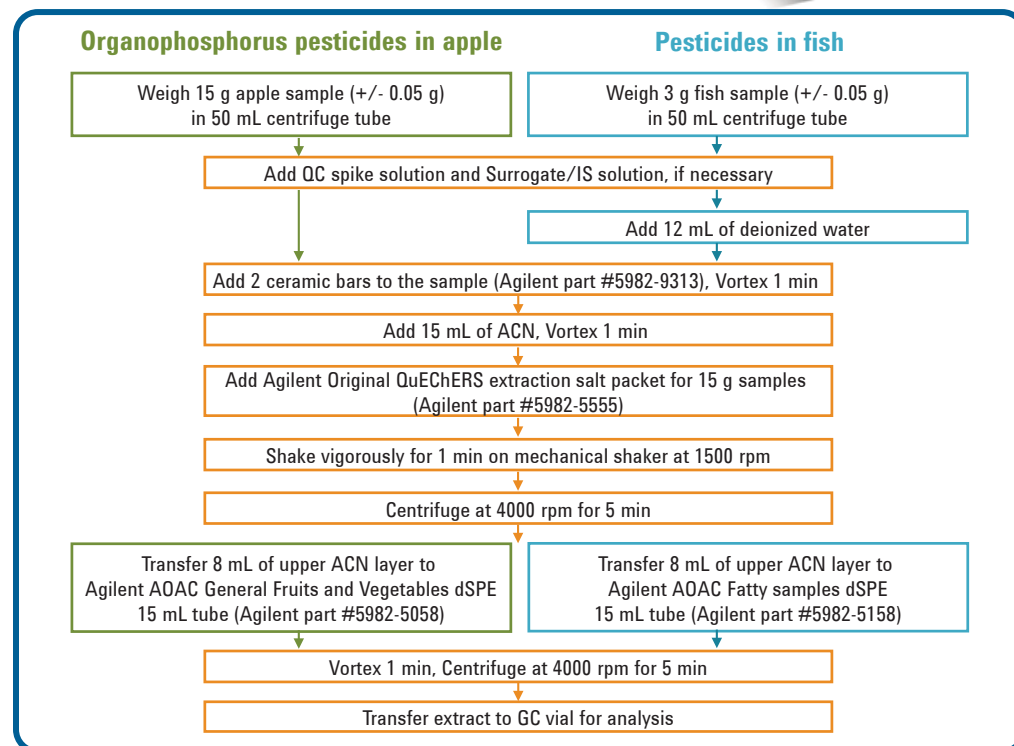
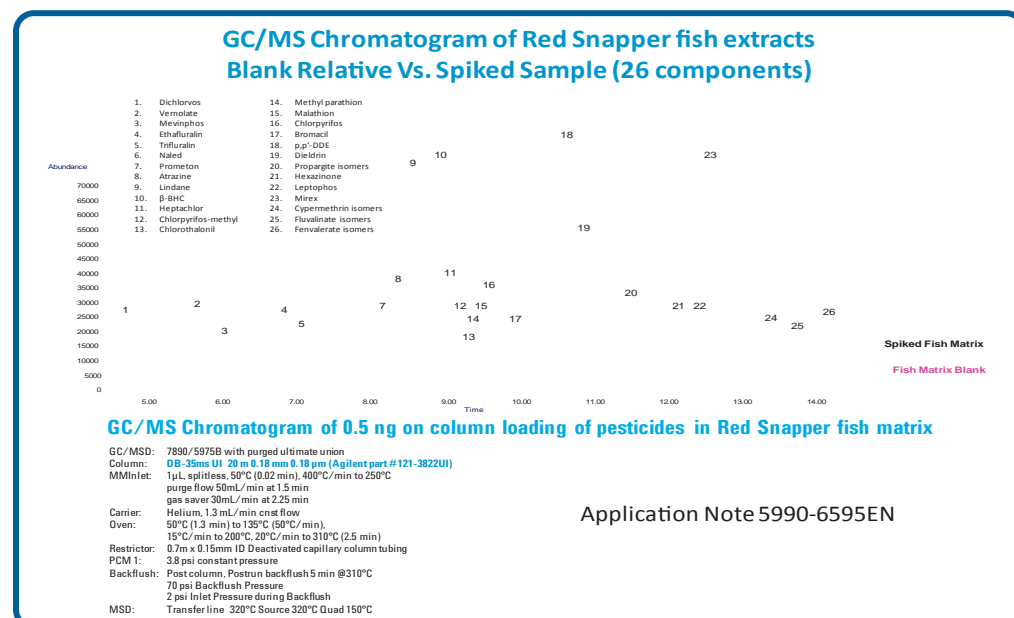


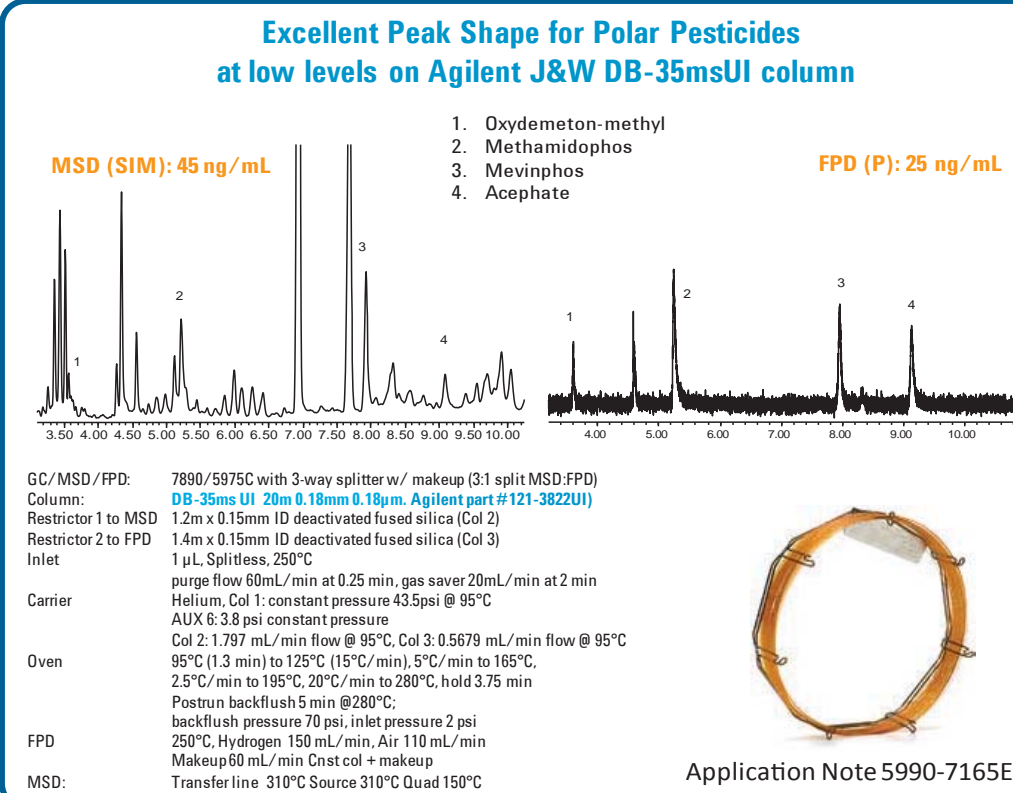
Figure 1. Flow chart of QuEChERS procedure for the determination of pesticides in apple and fish matrix

Ultra Inert Column Results

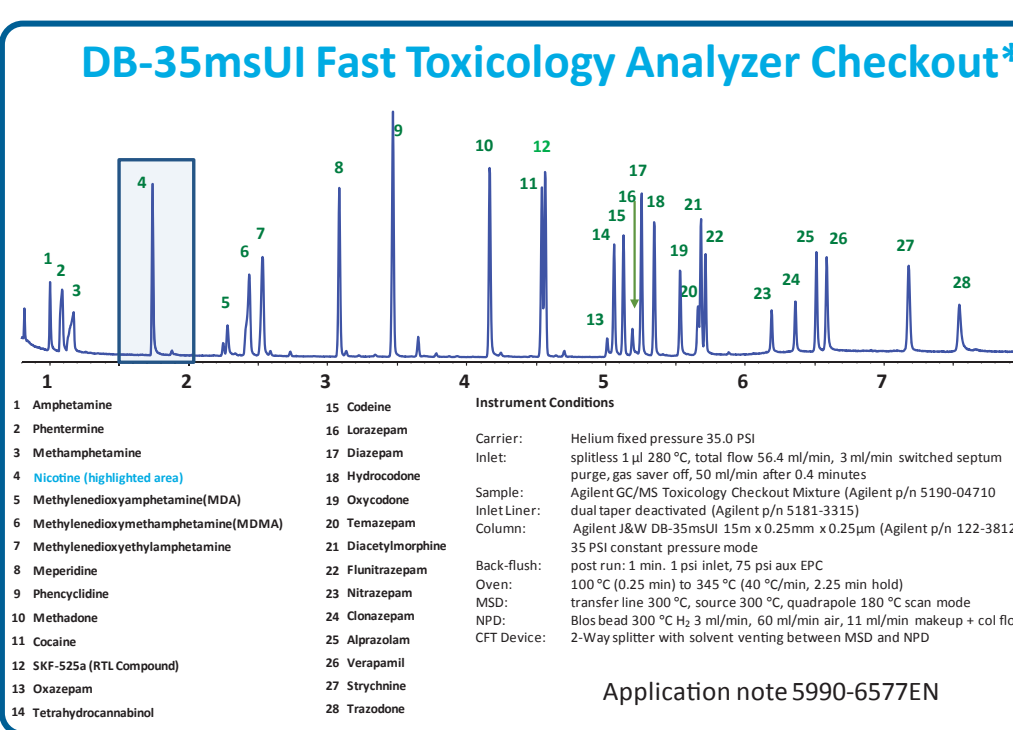


This application shows a GC/MS total ion chromatogram of a pesticide QuEChERS extract of a Red Snapper fish matrix. Peak shapes are excellent and the selectivity of the mid-polar DB-35ms UI stationary phase is very useful in resolving positional isomers.

Ultra Inert Column Results

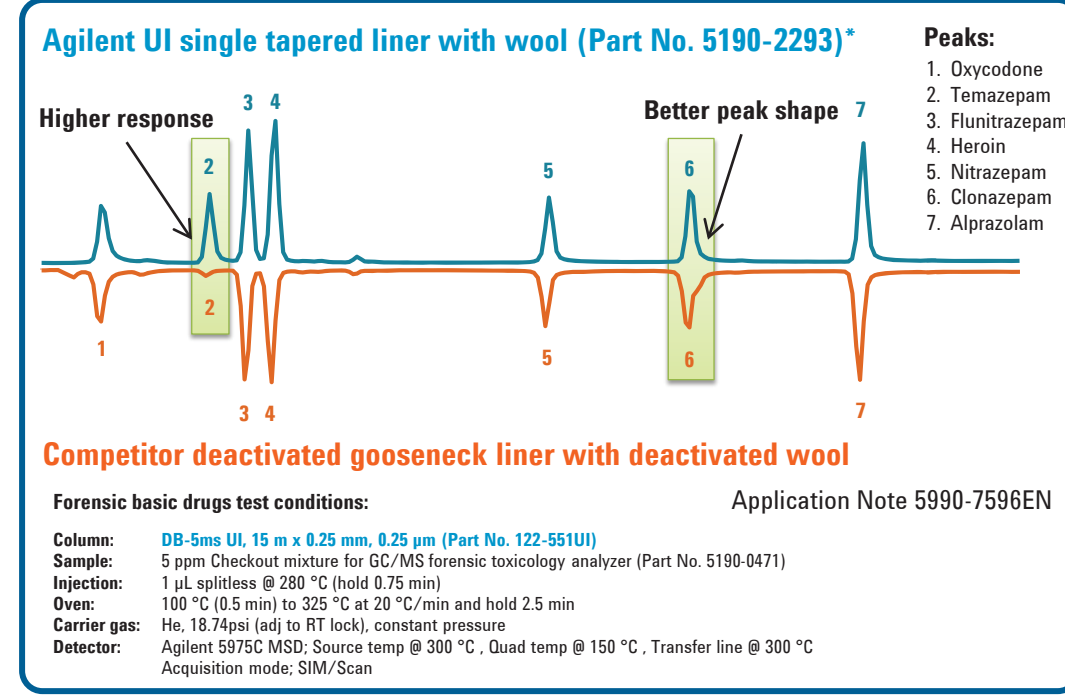


The second application demonstrates a GC/MS-SIM/FPD analysis of an organophosphorus spiked QuEChERS apple matrix extract. Organophosphorus pesticides, particularly the more polar pesticides can be problematic, often yielding broad peak shapes or excessive tailing making reliable quantitation at low levels difficult. The high level of inertness of the DB-35ms UI column results in better peak shape and decreased sample adsorption enabling lower detection limits.

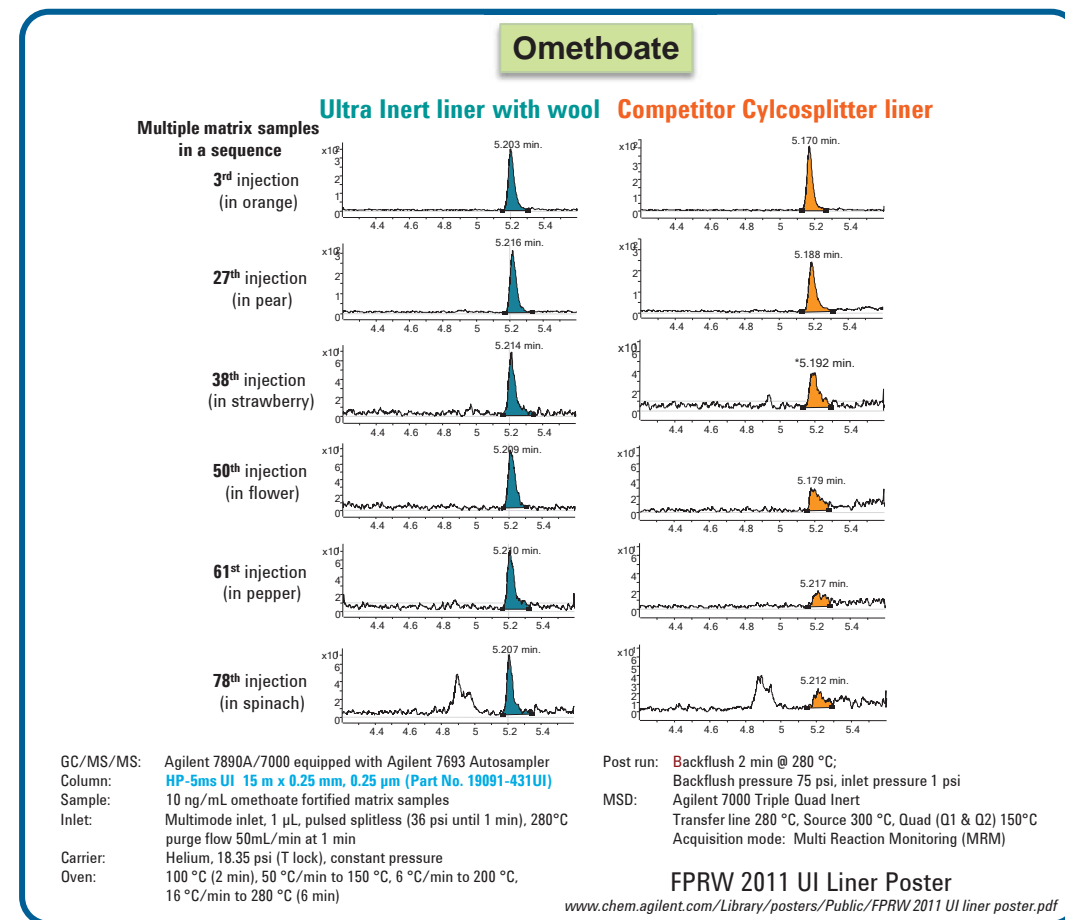


The third application shows the total ion chromatogram of an underivatized drugs checkout standard on a DB-35ms UI. Peaks shapes are excellent considering the basic nature of many of these compounds. The selectivity of the DB-35ms UI is very useful in separating oxycodone and oxymorphone derivatives in whole blood samples. This data was provided courtesy of Christine Giffin of the Delaware Office of the Chief Medical Examiner.

Ultra Inert Liner Results

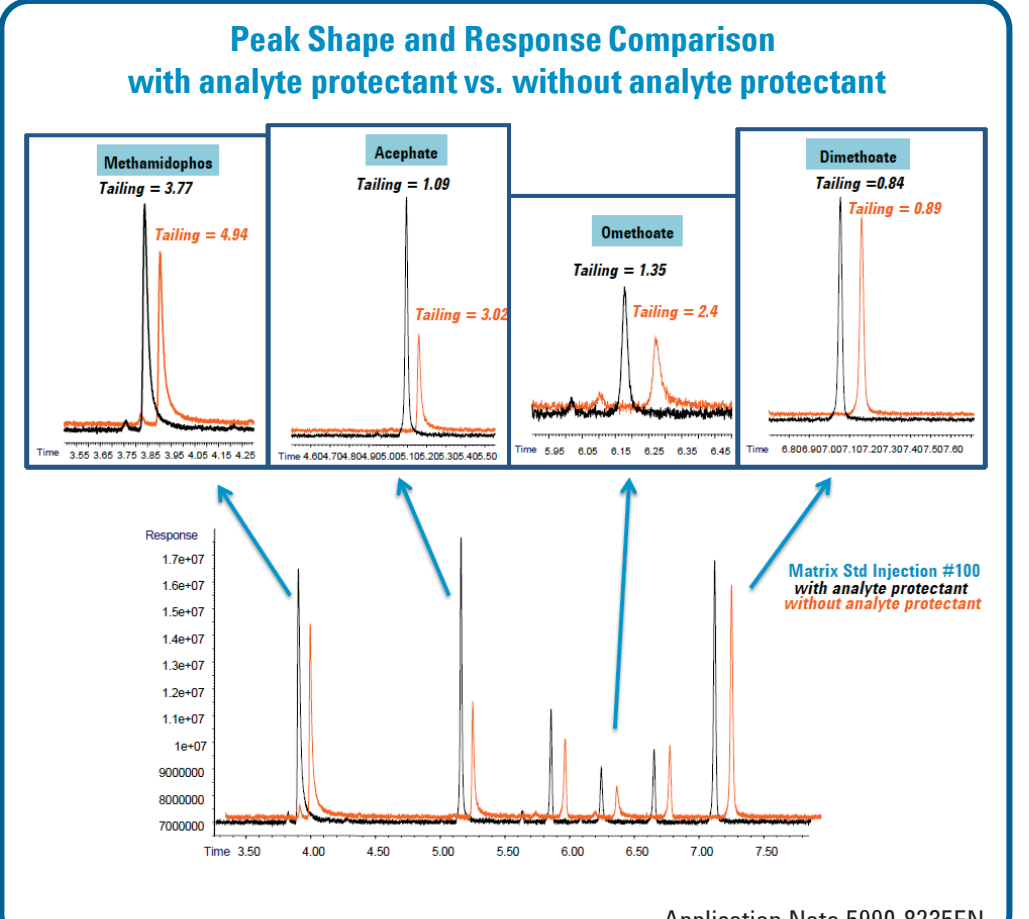


*For Forensic Use. Agilent's Ultra Inert deactivated liners with wool contribute to higher response and better peak shape for active forensic basic drug compounds than similar competitor liners.



This figure shows the comparative performance of an Ultra Inert liner with glass wool vs. a competitor liner for a critically active pesticide, omethoate, over multiple matrix injections. Loss of both analyte response and peak shape integrity is evident with the competitor liner, while the Ultra Inert liner with wool provided consistent results.

Ultra Inert Combination Results



A final example shows how effective the combination of UI liners, UI columns and analyte protectant can be for some particularly challenging organophosphorus pesticides in a QuEChERS olive oil matrix. In this example even after 100 injections of sample matrix the %RSDs are below 10% for methamidophos, acephate, omethoate and dimethoate.

Agilent Ultra Inert liner with deactivated wool Repeatability (%RSD)

100 injections of matrix standard with added analyte protectant

Pesticide	%RSD		
	10 injections	50 injections	100 injections
Methamidophos	1.0	1.2	2.7
Acephate	1.9	2.4	5.1
Omethoate	2.1	4.8	9.4
Dimethoate	1.5	2.8	3.8

For More Information

To access Agilent's Literature Library for application notes, visit us online at www.agilent.com/chem

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Conclusions

- Testing with aggressive probes is necessary for consistent and reliable inertness performance
- Ultra Inert liners with deactivated wool provide both low surface activity and highly reproducible sample vaporization
- Use Ultra Inert columns for critical applications
- Excellent performance over a range of applications
- Best choice for trace level analysis
- Ultra inert columns and liners consistently deliver less activity, better Peak Shape, and more Sample Signal

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