

# TheReporter

Reprinted from Volume 16, No. 1, 1997

T297071

© 1999 Sigma-Aldrich Co.

For more information, or current prices, contact your nearest Supelco subsidiary listed below. To obtain further contact information, visit our website ([www.sigma-aldrich.com](http://www.sigma-aldrich.com)), see the Supelco catalog, or contact Supelco, Bellefonte, PA 16823-0048 USA.

**ARGENTINA** • Sigma-Aldrich de Argentina, S.A. • Av. Pueyrredon 2446/50 • Piso 5-B • Buenos Aires 1119  
**AUSTRALIA** • Sigma-Aldrich Pty. Ltd. • Unit #2, 14 Anella Avenue • Castle Hill NSW 2154  
**AUSTRIA** • Sigma-Aldrich Handels GmbH • Hebbelplatz 7 • A-1110 Wien  
**BELGIUM** • Sigma-Aldrich N.V./S.A. • K. Cardijnplein 8 • B-2880 Bornem  
**BRAZIL** • Sigma-Aldrich Quimica Brasil Ltda. • Rua Sabara, 566-Conj. 53 • 01239-010 São Paulo, SP  
**CANADA** • Sigma-Aldrich Canada, Ltd. • 2149 Winston Park Dr., Oakville, ON L6H 6J8  
**CZECH REPUBLIC** • Sigma-Aldrich s.r.o. • Pobrezni 46 • 186 21 Praha 8  
**DENMARK** • Sigma-Aldrich Denmark A/S • Vejlegaardsvej 65B • DK-2665 Vallensbaek Strand  
**FINLAND** • Sigma-Aldrich Finland/YA-Kemia Oy • Teerisuonkuja 4 • FIN-00700 Helsinki  
**FRANCE** • Sigma-Aldrich Chimie • Chromatographie Supelco • L'Isle d'Abeau Chesnes - B.P. 701 • 38297 Saint-Quentin Fallavier Cedex  
**GERMANY** • Sigma-Aldrich Chemie GmbH • Geschäftsbereich Supelco • Grünwalder Weg 30 • D-82041 Deisenhofen  
**GREECE** • Sigma-Aldrich (o.m.) Ltd. • 72 Argonafton Str. • 16346 Ilioupoli, Athens  
**HUNGARY** • Sigma-Aldrich Kft. • Nagy Diófa u. 7., IV fl. • H-1067 Budapest  
**INDIA** • Sigma-Aldrich Co. • Survey No. 31/1, Sitharamapalaya • Mahadevapura P.O. • Bangalore 560 048  
**IRELAND** • Sigma-Aldrich Ireland Ltd. • Airton Road • Tallaght • Dublin 24  
**ISRAEL** • Sigma Israel Chemicals Ltd. • Park Rabin • Rohovot 76100  
**ITALY** • Sigma-Aldrich s.r.l. • Via Gallarate, 154 • 20151 Milano  
**JAPAN** • Sigma-Aldrich Japan K.K. • Division Supelco • JL Nihonbashi Building • 1-10-15 Nihonbashi Horidome-cho, Chuo-ku • Tokyo 103  
**KOREA** • Sigma-Aldrich Korea • Samhan Camus Annex, 10<sup>th</sup> Floor • 17-26 Yoido-dong, Yungdeungpo-ku • Seoul  
**MALAYSIA** • Sigma-Aldrich (M) Sdn. Bhd. • 9-2, Jalan 2/128, Taman Gembira • Off Jalan Kuchai Lama • 58200 Kuala Lumpur • Selangor  
**MEXICO** • Sigma-Aldrich Quimica S.A. de C.V. • Calle 6 North No. 107 • Parque Industrial Toluca 2000 • 50200 Toluca  
**NETHERLANDS** • Sigma-Aldrich Chemie BV • Postbus 27 • 3330 AA Zwijndrecht  
**NORWAY** • Sigma-Aldrich Norway • Sandakerveien 102 • N-0483 Oslo  
**POLAND** • Sigma-Aldrich Sp. z o.o. • Szelagowska 30 • 61-626 Poznań  
**PORTUGAL** • Sigma-Aldrich Quimica, S.A. • P.O. Box 131 • Sintra 2710  
**RUSSIA** • Sigma-Aldrich Russia • TOO Techmedbiochem • Makarenko Str. 2/21 • Building 1, Flat 22 • Moscow 103062  
**SINGAPORE** • Sigma-Aldrich Pte. Ltd. • 102E Pasir Panjang Road • #08-01 Citilink Warehouse • Singapore 118529  
**SOUTH AFRICA** • Sigma-Aldrich (pty) Ltd. • CNR Kelly & Ackerman Streets • Southern Life Industrial Park Unit • Unit 16/17 • Jet Park 1459  
**SPAIN** • Sigma-Aldrich Quimica, S.A. • Apt. Correos 161 • 28100 Alcobendas, Madrid  
**SWEDEN** • Sigma-Aldrich Sweden AB • Solkraftsvägen 14C • 135 70 Stockholm  
**SWITZERLAND** • Supelco Switzerland • Industriestrasse 25 • P.O. Box 260 • CH-9471 Buchs  
**UNITED KINGDOM** • Sigma-Aldrich Company Ltd. • Supelco UK • Fancy Road, Poole • Dorset BH12 4QH  
**UNITED STATES** • Supelco • Supelco Park • Bellefonte, PA 16823-0048 • Phone 800-247-6628 or 814-359-3441 • Fax 800-447-3044 or 814-359-3044 • email:supelco@sial.com

H

This article is archived from a past issue of The Supelco Reporter. Information in the article was appropriate at the time of publication, but product specifications, catalog numbers, and availability may have changed over time.

If you have questions about applying methodology described in this article to a current application, please contact our technical service chemists.



Supelco is a member of the Sigma-Aldrich family. Supelco products are sold through Sigma-Aldrich, Inc. Sigma-Aldrich warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product for a particular use. Additional terms and conditions may apply. Please see the reverse side of the invoice or packing slip.

# Extracting Drugs from Biological Fluids, Using ENVI-Carb SPE Tubes and GC Analysis

C. Szafranski and L. Nolan, Sample Handling, Supelco, Bellefonte, PA, USA

**Carbon-based ENVI-Carb solid phase extraction tubes have low back-ground for extracting cocaine from urine.**

Solid phase extraction (SPE) has long been an accepted sample preparation tool for extraction and purification of drugs from biological fluids. Specifically, SPE tubes packed with bonded silicas, such as octadecyl (C18)-modified silica, are used most often for these extractions. One major disadvantage of bonded silica SPE tubes is the large amount of interfering compounds extracted in addition to the drug. Adsorption of endogenous species via interactions with the bonded phase or

than on interactions with its functional groups, as bonded silica packings do. Therefore, ENVI™-Carb material offers a different selectivity for organic compounds compared to silica-based materials. We have found that the ENVI-Carb material has a special affinity for a broad range of compounds (polar and nonpolar) from aqueous solutions and can be used in extractions of biological fluids.

This study illustrates typical backgrounds observed by gas chromatography (GC) analysis of urine blanks and a cocaine-spiked urine sample, processed through ENVI-Carb SPE tubes. Two solvents were used to determine the best method of eluting cocaine from the tube, without eluting unwanted sample components. Cocaine-spiked serum also was extracted with ENVI-Carb tubes, with favorable results (chromatogram not shown here).

Figure A shows two analyses of a urine blank prepared with an ENVI-Carb SPE tube. One analysis uses methanol (MeOH) as the elution solvent. The same tube was then eluted with methylene chloride (MeCl<sub>2</sub>). The MeOH chromatogram is very congested, exhibiting a large amount of unwanted extractables. The MeCl<sub>2</sub> chromatogram shows fewer interferences.

Unlike its performance with C18-bonded silica SPE tubes, MeOH does not elute cocaine from ENVI-Carb tubes. This allows unwanted compounds to be washed out of the tube, then the cocaine to be eluted with MeCl<sub>2</sub>. Using MeOH first dries the tube and, therefore, improves GC analysis of the MeCl<sub>2</sub> extract.

An analysis of a cocaine-spiked urine sample is shown in Figure B. This chromatogram provides a distinct cocaine peak and very few interferences.

Combining the unique selectivity of ENVI-Carb SPE tubes with the proper elution method can provide an excellent alternative to bonded silica SPE tubes for clinical and toxicological applications.

## Ordering Information:

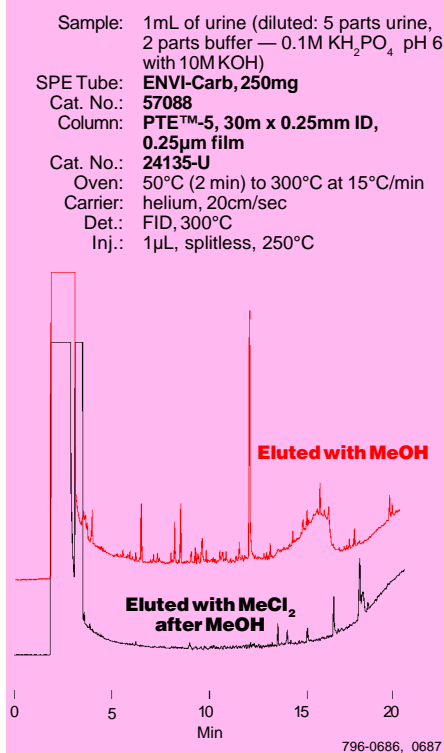
Description	Cat. No.
<b>ENVI-Carb SPE Tubes, 250mg</b>	
3mL, pk. of 54	57088
6mL, pk. of 30	57092
<b>Cocaine HCl Standard</b>	
1mg/mL in 1mL methanol	C1528-1ML
<b>PTE-5 Fused Silica Capillary Column</b>	
30m x 0.25mm ID, 0.25µm film	24135-U

ENVI and PTE are trademarks of Sigma-Aldrich Co.

Fused silica columns manufactured under HP US Pat. No. 4,293,415.



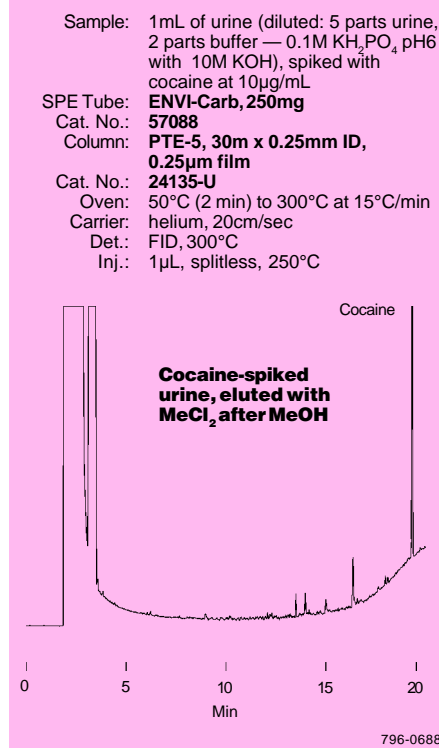
**Figure A. Urine Blanks with ENVI-Carb SPE Tubes**



the silica backbone often leads to dirty extracts. Chromatograms from these separations can be congested.

Carbon-based SPE materials, used extensively for environmental applications, may provide an alternative to the silica-based SPE tubes for drug analyses. Pure graphitic carbon retains an analyte based on its molecular structure, rather

**Figure B. Cocaine-Spiked Urine with ENVI-Carb SPE Tubes**



Reprinted from Volume 16, No. 1, 1997