

# Application

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## Screening for Drugs of Abuse on Wide Bore Capillary GC Columns

*Nonpolar, bonded phase SPB-1 columns offer fast, effective, and economical sample screening for acidic-neutral drugs (e.g., barbiturates) or basic drugs (amphetamines, cocaine, codeine, heroin, methadone, morphine, and others) at therapeutic or higher levels. A large sample capacity – up to 2000ng per drug – and compatibility with both capillary systems and packed column systems makes 0.53mm ID SPB-1 columns ideal for these analyses. Solid phase extraction removes nonvolatile sample components without reducing drug concentrations and helps prolong column life.*

### Key Words:

- drugs of abuse • amphetamines • barbiturates • cocaine
- codeine • heroin • methadone • morphine

Nonpolar, bonded phase SPB™-1 capillary columns offer fast, effective, and economical sample screening for acidic-neutral or basic drugs at therapeutic or higher levels. A 15m x 0.53mm ID SPB-1 column can resolve a mixture of more than 20 acid-neutral drugs in less than 20 minutes (Figure A). A combination of a flame ionization detector and a nitrogen-phosphorus detector increases the probability of correctly identifying the drugs (Figure B) from chromatograms. For greatest reliability, however, the resolved components can be identified by mass spectroscopy.

The same column will provide fast, reliable analyses of basic drugs (Figure C). The 0.5µm phase film is ideal for this analysis. The high boiling basic compounds are less retained than on thicker films. Consequently, peaks are sharper and analysis time shorter. Because there were more components in the basic drugs mix than in the acid-neutral drugs mix, at lower concentrations, we found the greater sensitivity of a nitrogen-phosphorus detector was more appropriate for the former analysis.

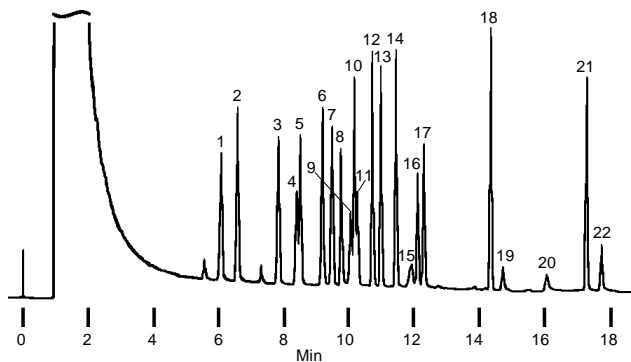
The concentrations of two or more drugs in a specific sample typically differ, sometimes significantly. Likewise, the concentration of any one drug typically differs from one sample to the next. These variations present no problem for an analyst using a 0.53mm ID SPB-1 column, because the column has a large sample capacity (up to 2000ng per drug).

0.53mm ID SPB-1 columns can be used in capillary systems or in packed column systems. In a capillary system these columns accept splitless or on-column injections. In a packed column system, these columns can be used with packed column injectors and detectors, and with autosampling devices. Furthermore, in packed column systems, these capillary columns require no more experience to use than packed columns. By using our injector

**Figure A. Rapid Screening for Acidic-Neutral Drugs**

Column: **SPB-1, 15m x 0.53mm ID, 0.5µm film**  
Cat. No.: **25314**  
Oven: **130°C to 290°C at 8°C/min**  
Carrier: **helium, 3mL/min**  
Det.: **FID**  
Inj.: **1µL methylene chloride containing 50ng each drug**

- |                  |                   |                       |
|------------------|-------------------|-----------------------|
| 1. Barbital      | 8. Meperidine     | 15. Theophylline      |
| 2. Methypylon    | 9. Meprobamate    | 16. Phenobarbital     |
| 3. Aprobarbital  | 10. Secobarbital  | 17. Cyclobarbital     |
| 4. Butabarbital  | 11. Caffeine      | 18. Methaqualone      |
| 5. Butalbital    | 12. Glutethimide  | 19. Primidone         |
| 6. Amobarbital   | 13. Hexobarbital  | 20. Phenytoin         |
| 7. Pentobarbital | 14. Mephobarbital | 21. Diazepam          |
|                  |                   | 22. Desmethyldiazepam |



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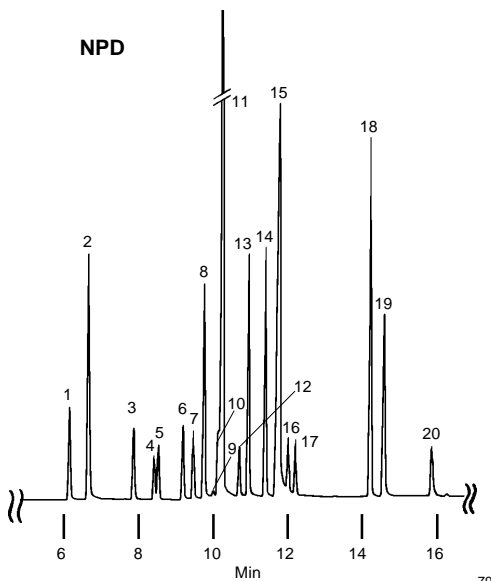
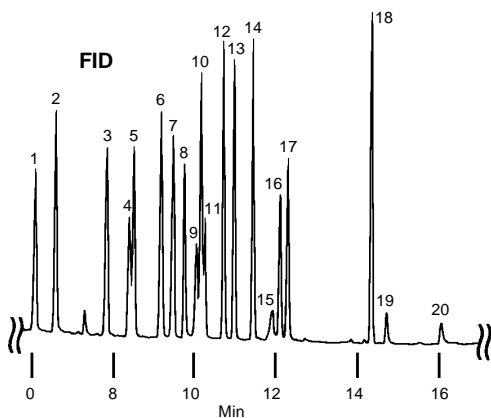
and detector conversion kits, you can easily and inexpensively adapt a packed column system to accept 0.53mm ID columns. The adapters also are easily removed, to return the system to packed column use. For more information about Supelco conversion kits, refer to the current Supelco catalog.

Nonvolatile materials in extracts from urine, plasma, or serum can accumulate at the column inlet and eventually cause column performance to deteriorate. To eliminate the need to rinse a contaminated column or break off a piece at the inlet end (either of which will eventually affect your analyses), connect a length of deactivated fused silica tubing to the column inlet. When the tubing becomes sufficiently contaminated, simply replace it. For a sample load of 100-200 extracted samples per month, results are best when the guard column is changed monthly and injection liners are changed at two week intervals (1). High purity, oxygen-free helium is equally important for maximum column life. (For more information about carrier gas purity, request free Bulletin 848.)

**Figure B. Acidic-Neutral Drugs on an SPB-1 Column, Using 2 Detectors**

Column: **SPB-1, 15m x 0.53mm ID, 0.5µm film**  
 Cat. No.: **25314**  
 Oven: 130°C to 290°C at 8°C/min  
 Carrier: helium, 3mL/min  
 Inj.: 1µL methylene chloride containing 50ng each drug

- |                 |                  |                   |
|-----------------|------------------|-------------------|
| 1. Barbitol     | 7. Pentobarbital | 14. Mephobarbital |
| 2. Methypylol   | 8. Meperidine    | 15. Theophylline  |
| 3. Aprobarbital | 9. Meprobamate   | 16. Phenobarbital |
| 4. Butobarbital | 10. Secobarbital | 17. Cyclobarbital |
| 5. Butalbital   | 11. Caffeine     | 18. Methaqualone  |
| 6. Amobarbital  | 12. Glutethimide | 19. Primidone     |
|                 | 13. Hexobarbital | 20. Phenytoin     |



**Reference**

- Thoma, J., South Bend Medical Foundation, Inc., South Bend, Indiana, USA (private communication).

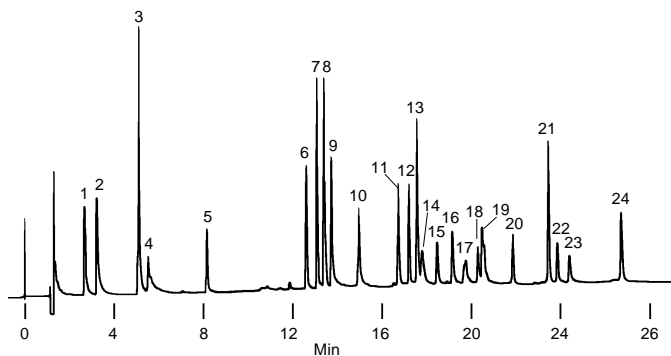
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**Figure C. Rapid Resolution of Basic Drugs**

Column: **SPB-1, 15m x 0.53mm ID, 0.5µm film**  
 Cat. No.: **25314**  
 Oven: 115°C (2 min) to 290°C at 7°C/min, hold 10 min  
 Carrier: helium, 2.5mL/min  
 Det.: NPD  
 Inj.: methanol containing 10ng/µL each drug

- |                    |                 |                      |
|--------------------|-----------------|----------------------|
| 1. Amphetamine     | 9. Doxylamine   | 17. Morphine         |
| 2. Methamphetamine | 10. Procaine    | 18. Oxycodone        |
| 3. Nicotine        | 11. Methadone   | 19. Chlordiazepoxide |
| 4. Ephedrine       | 12. Imipramine  | 20. Heroin           |
| 5. Benzocaine      | 13. Cocaine     | 21. Flurazepam       |
| 6. Benzphetamine   | 14. Desipramine | 22. Hydroxyzine      |
| 7. Phencyclidine   | 15. Scopolamine | 23. Papaverine       |
| 8. Lidocaine       | 16. Codeine     | 24. Thioridazine     |



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**Ordering Information:**

Description	Cat. No.
<b>SPB-1 Capillary Column</b> 15m x 0.53mm ID, 0.5µm film	<b>25314</b>
<b>Guard Column Components</b> GlasSeal™ connectors, fused silica, pk. of 5 Deactivated (nonpolar) fused silica tubing, 3 x 1-meter pieces, 0.53mm ID	<b>23627</b> <b>25307</b>
<b>Solid Phase Extraction Tubes</b> Supelclean LC-18, 1mL, pk. of 100	<b>504270</b>

For vacuum manifolds that enable you to process up to 24 samples at a time, refer to the Supelco catalog.

**Diagnostic Drug Standards**

We offer Sigma® standards for these and many other drugs. Please refer to the current Supelco catalog for descriptions and ordering information.

**Sample Preparation for Drug Screening**

To minimize introduction of nonvolatile serum components onto the analytical column, samples must be carefully prepared. Solid phase extraction conserves solvents and can be faster and more reliable than liquid-liquid extraction. For basic drugs, we suggest this procedure:

- Dilute 1mL blood serum with 1mL 0.1M Na<sub>2</sub>CO<sub>3</sub> (pH 9).
- Pass mixture dropwise through 1mL Supelclean™ LC-18 SPE tube, previously conditioned with 1mL methanol, then 1mL water.
- Wash packing with 3 x 500µL water.
- Dry packing with nitrogen for 5 minutes.
- Elute drugs with 3 x 100µL alcohol-ether (90:10).

If necessary, concentrate recovered drugs by evaporating some of the solvent.

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