

# *Happy New Year*

*from the Scientists and Staff*  
*of STERLING Reference Laboratories*

Fourth Quarter, 2007 – TECHNICAL CONTENT

## Technical Information from STERLING Reference Laboratories

### How Does Drug Testing Work? – Part II

An earlier newsletter discussed immunoassay screening tests and the importance of using GC/MS to confirm any positive screens. This newsletter will focus on chromatography based testing as employed by STERLING.

### What is Chromatography?

Chromatography is a process of separating and isolating the various drug components in a urine sample. All chromatographic procedures require a stationary (fixed) phase and a mobile (moving) phase for separation, and a detection method for identifying any drugs present. STERLING uses the following chromatographic testing methodologies: Liquid Chromatography with tandem Mass Spectrometry (LC/MS/MS); Gas Chromatography/Mass Spectrometry (GC/MS); Gas Chromatography (GC); and infrequently, Thin Layer Chromatography (TLC).

### What is LC/MS/MS and how is STERLING using it?

For LC, the stationary phase is a dimethyl-n-octadecylsilane monolayer bonded to a porous silica support that is kept at a constant temperature. The mobile phase is a combination of de-ionized water, acetonitrile and formic acid. A test sample is introduced to the column via an injector port where it is carried through the column by the mobile phase at a set flow rate and temperature. The test sample is then introduced to the mass spectrometer (MS) where it is converted from a liquid to an ionized form by spraying a very fine mist and, under the flow of heated nitrogen, drying the liquid. The identification of drugs is based on the time that a substance elutes from the column (retention time) and detection of parent ions. The parent ions are then broken apart creating daughter ions of specific size and charge that are unique to each drug being detected. This creates a unique chemical "fingerprint" of the substance present, so that it can be reliably identified. Advantages of LC/MS/MS over GC/MS include a more flexible test menu, reduced sample preparation time, smaller specimen volumes, improved selectivity for many drug classes, etc.

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These and other advantages allow LC/MS/MS to be used as a screening tool and as a tool for confirmation testing. At STERLING our instruments are currently dedicated to screening for and confirming the presence of ethylglucuronide (EtG). Other assays are currently under development. Watch for announcements as our LC/MS/MS test menu grows.

### What is a GC/MS and how is STERLING using it?

For GC/MS, the stationary phase is a fused silica glass column. The mobile phase is an inert gas. A test sample is introduced to the column via an injector port where the specimen is vaporized and transported through the column by the carrier gas at a specified temperature and flow rate. The detector is a mass selective ion detector (MSD). The identification of drugs is based on retention time and the selective ion pattern that is unique to each drug or metabolite, thus creating a unique chemical "fingerprint" of the substance present, so that it can be reliably identified. GC/MS, the "Gold Standard" in routine drug testing, is a well documented method for confirming the identity of substances detected in a screening test, but is too labor intensive to serve as a useful screening tool. GC/MS is the primary confirmation method that STERLING uses for the most commonly monitored drugs of abuse.

### What is a GC and how is STERLING using it?

For GC, the stationary phase is a packed glass column held at a constant temperature. The mobile phase is an inert gas. A test sample is introduced to the column via an injector port where the specimen is vaporized and transported through the column by the carrier gas at a specified temperature and flow rate. The detector is a flame ionization detector (FID). The identification of drugs is based on the time that a substance elutes from the column and is detected by the FID relative to an internal standard (relative retention time). GC is only used by STERLING to confirm the presence of ethyl alcohol (ethanol) in a specimen. It can also be used to detect certain other volatile substances, typically methanol and acetone.

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## **Technical Information - continued**

### **What is a TLC and how is STERLING using it?**

For TLC, the stationary phase is an adsorbent such as silica gel applied to a glass plate, special paper, or a plastic film. The mobile phase is an appropriate solvent that moves the test sample from the application zone up through the adsorbent, allowing any drugs present to be separated for easy identification. The detection method for TLC is a combination of color characteristics developed after exposure to specific chemicals or dyes and the distance the compound has traveled from the point of application. TLC lacks the sensitivity of LC/MS/MS or GC/MS so it is not suitable for routine confirmation of positive drug screens. The TLC protocol used by STERLING was developed primarily for use as a tool to aid in identifying drugs that might be present in overdose cases. TLC is a great adjunct to routine drugs of abuse testing since this technology helps identify any over the counter or prescription medications a person might be taking in addition to those drugs detected in the standard drug screens. Because TLC technology is lacking in sensitivity, normal dosing of many drugs may go undetected, while heavy dosing (misuse, abuse?) will be detected.

*Contact our sales department (1-800-442-4038 or [sales@regtox.com](mailto:sales@regtox.com)) for assistance in selecting the testing protocol that best suits your client base and budget.*