



## United States Drug Testing Laboratories, Inc.

### Up Coming Events:

- Oct. 9 -12 – CoLap – Grand Rapids, MI
- Oct 11-13 – 3rd Western Conference on Behavioral Health & Addictive disorders – Newport Beach
- Oct. 13-17 – ASA – Washington, DC – Booth 1550
- Oct. 18-21 – TAAP Houston – Houston, TX
- Oct. 24 – CCLMA – Chicago
- Oct. 25-27 – AMA, CMA, BMA International – Montreal, CA
- Nov. 9-10 – US Psychiatric and Mental Health Congress – San Diego, CA

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### Testing Nails for Drugs

by Douglas Lewis, DSc, President, Scientific Director, USDTL

Testing nails for drugs has been a useful tool for more than twenty five years. It has only been in recent years, however, that fingernails have been re-evaluated as a forensic matrix with utility to provide better detection for certain drugs and even provide a degree of dose-response relationship. Studies conducted in the late 1980's on anti-fungal drugs used to treat fungal infected nails showed that fingernails and toenails grew not only in length from germinal matrix but continually in thickness from the distal matrix, thus drugs and metabolites were added from the beginning of nail growth and then all along the ventral surface as the nails grew in length. When the nail emerges from the matrix, there is a one to two week lag until the nail is sufficiently long enough to safely clip and collect a specimen. This lag is similar to the time hair takes to grow up from the follicle and emerge above the scalp line high enough to cut safely.

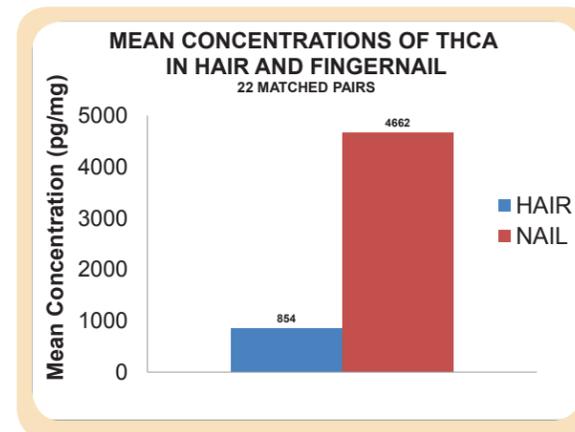
Nails have a distinct advantage over hair. Hair is often treated cosmetically with agents such as bleaches, dyes, permanents and straighteners that destroy drug substances in the hair thereby reducing or eliminating the presence of the offending substances. Nails are not treated in the same manner. Nail polishes have not been shown to be effective adulterants. Prosthetic nails are like hair weaves, a substitution and not a valid specimen.

#### ETG Sensitivity in Fingernail vs Hair

In a recent study, 606 college students provided detailed alcohol consumption histories via the time-line, follow-back technique along with hair and fingernail specimens for alcohol biomarker ethyl glucuronide (EtG) analysis. A detailed breakdown of the data showed that male fingernail and hair EtG strongly correlated with reported alcohol histories. Female fingernail EtG had the same strong correlation but hair EtG showed a diminished correlation when compared to male peers. Additionally, the mean fingernail EtG concentration for all positive specimens was 2.5 times the mean hair concentrations. While the data did not allow any inferences other than gender difference, previous data that showed EtG susceptibility to peroxide oxidation suggests that cosmetic treatment of hair may be a biasing factor.

#### Carboxy-THC Sensitivity in Fingernail vs Hair

In another recent study, de-identified, paired hair-fingernail specimens were analyzed for Carboxy-THC at the SAMHSA Proposed Mandatory Guidelines for Federal Workplace Drug Testing Confirmation Cut Off concentration of 0.05 pg/mg (50 fg/mg). Of the 120 specimens tested, 31% of the hair specimens tested positive with a mean concentration of 854 fg/mg, while 41% of the fingernail specimens tested positive with a mean concentration of 4662 fg/mg. Positive Carboxy-THC in fingernail specimens were on average 5.5 times higher than positive hair specimens.



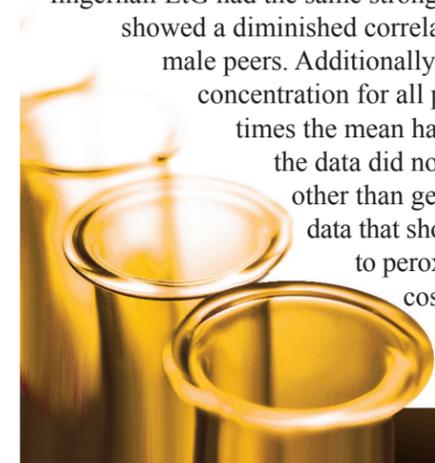
#### What is the Window of Detection?

A frequent question that arises concerning nail testing is "What is the window of detection for fingernails?" There are a limited number of references in the literature that fully describe the window of detection of nail as a drug testing specimen type. But, this information is not critical for our intended applications. The available literature indicate that some drugs wash out as quickly as 3 months while some can be retained

for many more months. The theoretical upper limit is the age of the nail material, which for the average person is 5-6 months minus the washout rate. However, some individuals may have slighter faster nail growth while others may have slightly slower. Also, a major consideration in the detection window is how high the original drug exposure level was. What we know is that nail has a long window of detection; longer in some instances than hair and that some compounds in nails may have predictable dose-response relationships.

Fingernails show much promise in the forensic toxicology area. They allow analysis for compounds that can be difficult to monitor in body fluids and easily adulterated in hair but accumulate and can be detected and quantified in fingernails.

2012 is Douglas Lewis' 21st year as president and scientific director of USDTL. Prior to USDTL, he spent five years as an assistant professor of clinical pathology at Northwestern University Medical School while also serving as the head of the toxicology section at the Children's Memorial Hospital in Chicago. During his tenure at Northwestern and Children's, Lewis established the first non-Olympic anabolic steroids testing lab in the United States and was a toxicologist for the U.S. Weight Lifting Federation. He also developed new specimens such as meconium for use in diagnosing substance-exposed newborns.



## The Stability of Drugs in Hair After Treatment With Two Varieties of Chemical Straighteners (Those Containing Lye And Those Not Containing Lye)

By: Dr. Jeanita S. Pritchett

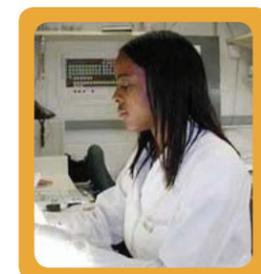
**H**air testing is gaining popularity as a specimen of choice when it comes to testing for drugs of abuse. It is important, therefore, to study its limitations as well as its advantages. While attending the 2012 SoHT conference, we listened to a very important presentation on the influence of chemical straightening on the stability of drugs of abuse in hair samples treated by two different kinds of relaxers/straighteners by Dr. Jeanita Pritchett. She agreed to an interview to introduce her study and her findings to our readers.

[USDTL]: **Dr. Pritchett, could you please give our readers a little bit about your background and work you have done.**

[JSP]: I graduated with a B.S. in Professional Chemistry from Tennessee State University in 2005, and then followed up with a Ph.D. in Analytical Chemistry in 2011 from the University of Illinois at Chicago. After completion of my degree, I was awarded a National Research Council Postdoctoral Fellowship at the National Institute of Standards and Technology (NIST) in Gaithersburg MD. Since beginning at NIST, I have had the opportunity to participate in a multitude of forensic and toxicology related research projects.

[USDTL]: **What made you question the role hair relaxers may play in screening substances of abuse in hair samples?**

[JSP]: While perusing articles concerning the effects of cosmetic treatments on the stability of illicit drugs found in hair, I realized that I had not come across any that focused on what occurs after application of a chemical straightener (also known as a Relaxer) to hair. I found an abundance of articles that examined the effects of common treatments such as shampooing, dyeing, and alkaline waving (Perm). We hypothesized that there would be a high degree of change in the measured concentration of illicit drugs post application of relaxers. Fortunately, at NIST we have two Standard Reference Materials (SRMs) with certified values for the drugs of interest in this study (cocaine and its major metabolites benzoylecgonine and cocaethylene, phencyclidine, and Δ-9 tetrahydrocannabinol) which we could use to test this theory in a more controlled environment.



[USDTL]: **Did you see a significant trend in your results?**

[JSP]: Yes we did. In fact, only 6-67% of the original concentration remained after a single chemical straightening treatment with the greatest effect being on cocaine. Since the SRMs consist of drug fortified hairs, we also tested hairs clipped from authentic cocaine users who had ingested the drug. After the specimens from an authentic user were treated for 15 minutes with both types of relaxer (Lye and No-Lye), only 5-30% of Benzoylecgonine (BZE), Cocaine (COC), and Cocaethylene (CE) remained when compared to a sample of the same user that was not treated with either type of relaxer (Control).

[USDTL]: **Were you surprised by your results?**

**Why or why not?**

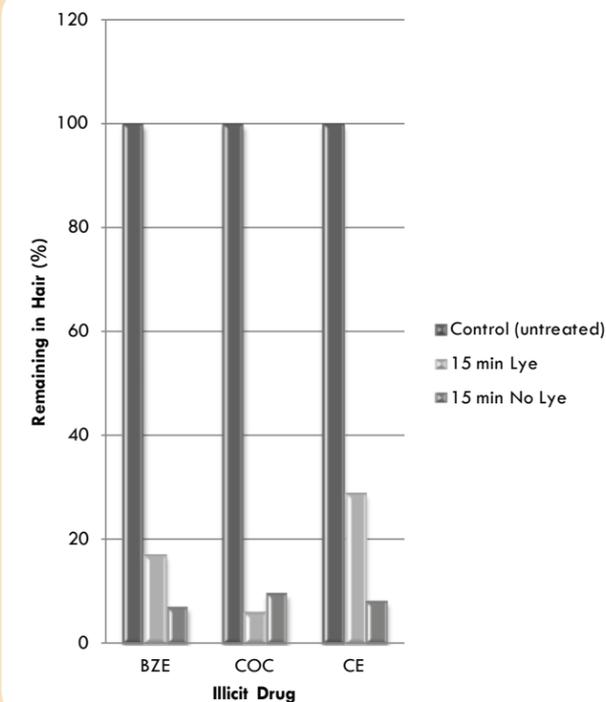
[JSP]: Considering the harsh conditions (high pH 12-14) that the hair is being exposed to and the fact that the cuticle is being lifted as well as disulfide bonds being broken, I wasn't surprised by the results. A similar attenuation was seen by others after shampooing, dyeing, and alkaline waving.

[USDTL]: **What is your study's main message take-away for our readers?**

[JSP]: Results of this study have demonstrated that it would be possible for a drug abuser to intentionally apply a relaxer to yield drug concentrations approaching or below the established National Institute on Drug Abuse/Society of Hair Testing cut-off levels. Because of this, the analyst should inquire about a subject's cosmetic treatment history prior to analysis to ensure accurate results are obtained.

[USDTL]: **Thank you Dr. Pritchett for your insight and for sharing your study with our readers.**

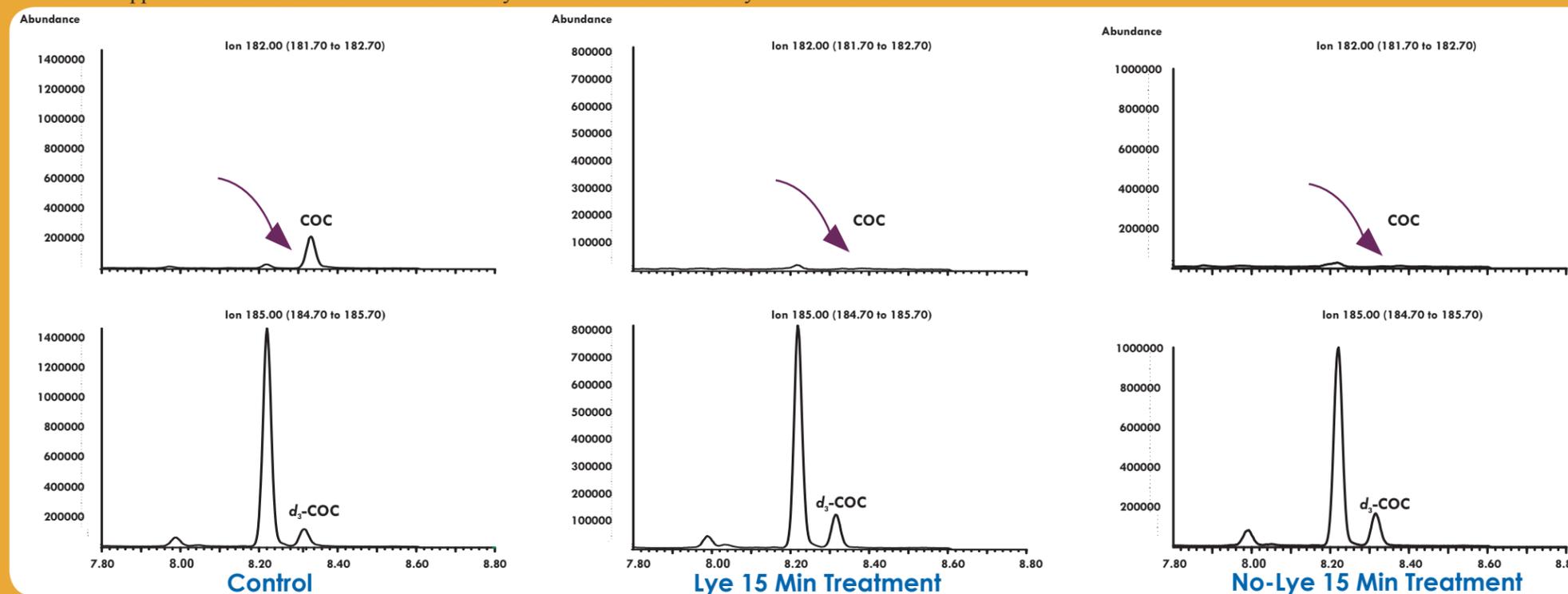
### Authentic Drug Users Hair



Significant loss of BAE, COC, CE, PCP, and THC after treatment with both Lye based relaxer and non-Lye based relaxer

### Effect of Relaxer on Cocaine in Authentic Drug Users Hair

Cocaine disappears after the hair is treated with both Lye based relaxer and non-Lye based relaxer.



### NIST Reference Standards

