

A Historical Perspective of Hair as a Drug Testing Matrix

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Brief History of Hair Analysis

- 1858 – Hoppe published report finding arsenic in hair
- Used to detect toxic heavy metals/poisons for more than 100 years
- 1977 – Baumgartner invents “RIAH” at Wadsworth VA Lab in LA transferring solid hair into a liquid phase and examining like a urine specimen [initially detecting opiates] – 1st modern use of hair drug testing
- 1980 – Arnold introduces RIAH in Germany generating some controversy
- 1980 – Valente reports detection of cocaine in human hair
- 1980 – Klug confirms RIA results with a chromatographic method
- 1986 – Use of GC/MS [Mass selective detector] improved detection sensitivity and specificity allowing many other drugs to be identified
- 1995 - Society of Hair Testing formed – Annual meetings – PT program
- 2013 – Over last 30 years improved chromatographic – mass spectrometric techniques, new methods of sample preparation and wash procedures have improved detection limits from the ng/mg range to pg/mg range

Consideration of Hair for Federal Testing Programs I

- 1987 – NIDA began consideration of hair as a test matrix for the federal drug testing program. Numerous meetings with Dr. Baumgartner and others to determine feasibility.
- May 1990 – NIDA in collaboration with NIJ sponsored an 2-day independent technical review of the state of the science of hair testing for drugs of abuse. Conducted by the Society of Forensic Toxicologists [SOFT] their consensus report stated “The use of hair analysis for employee and pre-employment drug testing is premature and cannot be supported by the current information on hair analysis for drugs of abuse.”
- June 1990 – FDA issued a Compliance Policy Guide for RIAH stating that there was no FDA regulated RIA product on the market that has demonstrated to be effective in testing hair for the presence of drugs of abuse

Consideration of Hair for Federal Testing Programs II

- 1992 – SOFT issued a revised Consensus document which concluded that “some unanswered questions indicating important deficiencies in our present knowledge of the analysis of hair are delineated [within the document] above. The committee concluded that, because of these deficiencies, results of hair analysis alone do not constitute sufficient evidence of drug use for application *in* the workplace.”
- 1993 – NIST – conducted a 4- round proficiency test study of multiple laboratories performing hair testing for drugs of abuse. Results indicated a detection rate @ 89% [correctly identifying drugs in samples actually containing drug] and a 5% false positive rate
- 1994 – DWP/SAMHSA sponsored a second independent SOFT conference on Drug Testing in Hair in conjunction with TIAFT. Presentations indicated that too many analytical issues remained unresolved which undermined confidence in the accuracy and reliability of test results for hair to be used in workplace programs.
- 1997 – DTAB [April 28-30, Sept. 9-10] Alternative Specimens

Consideration of Hair for Federal Testing Programs III

1998 DWP/SAMHSA/HHS forms industry led working group to advise how hair could be integrated into the federal program

- Members Included: Dr. Donald Kippenberger [chair], Dr. Werner Baumgartner, Dr. David Brill, John Irving, Dr. Ray Kelly, Dr. Thomas Mieczkowski, Dr. Lance Presley, Dr. Steve Van Nus
- In addition to DTAB meetings the group met with many other experts to develop recommendations for SAMHSA in separate meetings on:
 - November 12/13, 1998 in San Antonio
 - January 7/8, 1999 in San Antonio
 - May 29/30, 1999 in San Antonio
 - January 21, 2001 in Las Vegas
- Recommendations from the working group were integrated into a proposal to include hair as a test matrix in the federal program

Consideration of Hair for Federal Testing Programs IV

- 2000 - 2007 – RTI conducts 7 – year program [23 cycles] of proficiency testing hair samples with 7 hair testing lab participating
 - Initial results showed major inconsistencies across the labs
 - Over the seven year evaluation there were significant improvements in most participant labs, on most of the analytes being evaluated
- 2004 - DWP/SAMHSA published an NPRM in the FR for review and comment which proposed to include hair in the federal programs
- 2008 – DWP/SAMHSA published a final notice indicating that “The submitted public comments and additional comments raised by Federal Agencies during subsequent internal reviewraised significant scientific, legal, and public policy concerns about the use of alternative specimens”.

Consideration of Hair for Federal Testing Programs V

- 2009 – RTI issued final report on distinguishing between cocaine “use” versus “contamination” in hair [DOJ sponsored research]
- 2009 -FBI suspends hair testing in non –criminal cases
- 2009 – Dr. Kippenberger recommends DOD labs cease hair testing
- Over the last 25 years federal agencies have provided Grants and Contracts to support research on developing the use of hair testing in workplace and criminal justice programs:
 - NIDA
 - SAMHSA
 - Dept. of Justice
 - National Institute on Justice

Where are we now with regard to integrating hair into federal programs?

- Methods have improved significantly over last 25 years
- Laboratory performance has improved
- Criteria for what constitutes a positive test have changed dramatically over the last 20 years
- A number of issues still remain unresolved:
 - Scientific Questions
 - Legal Issues

Scientific Concerns Related to the Use of Hair in Workplace Testing

- Mechanisms of exactly how drugs/metabolites get into hair
- Issues with wash kinetics and metabolite ratios
- Environmental or External Contamination
- Hair color bias
- Interpretation of test results – “use” vs. “exposure”
- Comparability of results to other test matrices
- Relatively low sensitivity to Marijuana
- Relative high sensitivity to Cocaine

Legal Issues

- Currently a number of state/territorial laws would prohibit/limit the use of hair as a specimen for workplace drug testing [e.g. Iowa, MT, Oregon, Vermont, and Puerto Rico]
- 2012 - Boston PD Case – Fed. Civil Rights – No disparate impact
- March 2013 decision by the Massachusetts Civil Service Commission re Boston Police Case – “The present state of hair testing for drugs of abuse, while potentially useful in clinical assessment settings, and in the context of child custody, criminal probation and pre-employment hiring decisions, does not meet the standard of reliability necessary to be routinely used as the sole grounds to terminate a tenured public employee under just cause standards governing civil service employees under Massachusetts law”
- ADA – Current use of illegal drugs vs. Past history but no current use

SAMHSA MRO Project Comparing General trends in Urine, Oral Fluid and Hair Test Results from Workplace Programs 2003-2007

- All unregulated tests
- Predominately pre-employment tests
- Included all lab test results in comparison
- Urine specimens [\approx 4.3 Million}
- Oral Fluid specimens [\approx 650 thousand]
- Hair specimens [\approx 47 thousand]
- Not same donors providing urine, hair, OF
- Specimens tested by different labs [majority of hair specimens tested by Quest & Psychemedics, majority of OF specimens tested by LabCorp & Quest]

Non-Regulated Tests

% Tests by Reason for Test

Reason	Urine	Oral Fluid	Hair
Pre-employment	80.9%	78.1%	94.8%
Random	10.6%	13.3%	0.9%
Post Accident	4.0%	2.9%	0.1%
Other	3.2%	5.0%	3.5%
For Cause	0.3%	0.7%	<0.1%
Return to Duty	0.4%	0.3%	<0.1%

A comparison of the % Total Lab Positives Urine - Oral Fluid – Hair 2003-2007 non-regulated workplace tests

- Laboratory Positive Test Rates
 - Urine: 4.09%
 - Oral fluid: 4.28%
 - Hair: 10.53%

Drug	Urine, %	Oral Fluid, %	Hair, %
Amphetamines	3.4	4.3	3.2
Methamphetamines	2.5	6.4	9.28
Cocaine	17.7	24.1	47.94
Marijuana	72	60.4	38.5
Opiates	4.45	3.9	4.63
PCP	0.4	0.5	0.12

Comparability Issues

- Urine/OF detects use in last few days, Hair last 90 days
- Lab positive rates appear comparable between urine and oral fluid
- Lab positive rates for hair are 2.5 times higher
- Frequency distribution of drugs identified are comparable between urine and oral fluid
- Frequency distribution of lab positives with the hair matrix are different [significantly higher rates of cocaine and methamphetamine positives, and significantly lower rates for marijuana]

Summary I

Massachusetts Civil Services Commission Decision, March 2013 “Workplace hair testing for drugs, as distinct from urinalysis, has been and remains a “work in progress”. There has been a long-standing debate within both the scientific and law enforcement communities as to how accurately hair tests are able to differentiate between drug found in hair due to ingestion as opposed to contamination by external or passive means. There are no uniform, nationally approved standards for hair testing. Protocols vary from laboratory to laboratory and have changed significantly over time. Depending on what protocol is applied, what laboratory does the testing, or what instrumentation is used, many Appellants would test negative rather than positive.”

Summary II

Today is the beginning of a new process for the Drug Testing Advisory Board to inform and discuss the current state of the art in hair drug test methods and to further explore the suitability of Hair Testing in federal drug testing programs