

Alternative Matrices

Drug Testing Advisor Board Meeting

Presented by

Ron R. Flegel, B.S., MT(ASCP), M.S.

Division of Workplace Programs

January 26, 2011

Drug Testing Advisory Board

Introduction

- Main Objectives
 - Review the 2004 Proposed Mandatory Guidelines for Alternative Specimens
 - Alternative Matrices will Require Further Examination and Additional Studies
 - Continued evolution of New Forensic Technologies and Laboratory Analysis
 - Harmonizing with Other Federal Agencies Drug Testing Policies

Federal Register, Nov 25, 2008

**Federal Register / Vol. 73, No. 228 / Tuesday, November 25, 2008 /
Notices**

Additional notices of Proposed Revisions to the Mandatory Guidelines addressing the use of point of collection testing (POCT), oral fluid testing, sweat patch testing, hair testing, and associated issues will be published at a later date. With regard to the use of alternative specimens including hair, oral fluid, and sweat patch specimens in Federal Workplace Drug Testing Programs, significant issues have been raised by Federal agencies during the review process which require further examination, and may require additional study and analysis.

Specimens Rejected by an HHS-Certified Laboratory (December 2009 – May 2010)

- Total number of rejected specimens: 349
- Percentage of the total number of specimens that were rejected: 0.38%
- No quality control issue can be overlooked in the Federal program

Reason for Rejection	% of Rejected Specimens
Specimen volume less than 30 mL	68%
Broken seal or evidence of tampering	24%
CCF: Missing collector name <u>and</u> signature	6%
Incorrect CCF	1.5%

Parameters for Development

- Scientific acceptability
- Court/legal acceptability
- Community acceptability
- FDA approval
- Establishing cutoffs
- Quality assurance and performance testing
- Cost/benefit

Reliable Workplace Drug Testing Program

- A. Collection Site
- B. Donor
- C. Specimen
- D. Collection Device
- E. Collector
- F. Transportation of Specimen
- G. Point-of-Collection Initial Testing
- H. Laboratory Process/Analysis
- I. Quality Control and Quality Assurance
- J. Reporting
- K. Interpretation of Results

Drug Testing Profiles

Specimen	Concentration	Time Frame
Blood	Third highest peak	Hours to days
Oral Fluid	Second highest peak	Hours to days
Urine	Highest peak	Hours to weeks
Hair	Lowest peak	Weeks to Months

Proposed Specimens

- Reasons for specimen collected

Reason for Test	Primary Specimen
Pre-employment	H, <u>OF</u> , U*
Random	H, <u>OF</u> , U*
Reasonable suspicion	OF, U*
Post-accident	OF, U*
Return to duty	H, <u>OF</u> , S, <u>U</u> *
Follow-up	H, <u>OF</u> , S, <u>U</u> *

Proposed Specimens *(continued)*

- Minimum Amount of Specimen Collected

Specimen	Amount Collected
Hair	100 mg hair
Oral fluid	2 mL “neat specimen” (1.5 mL primary, 0.5 mL split)
Sweat	FDA cleared “patch” worn for 7 to 14 days
Urine	45 mL (30 mL primary, 15 mL split)

- Allow only split specimen collection

Urine

Analytes and Cutoffs (ng/mL)

Analyte	Initial Cutoff	Confirmation Cutoff
Marijuana metabolite	50	15
Cocaine Metabolite	150	100
Opiate Metabolites	2000	
Morphine		2000
Codeine		2000
6-AM		10
Phencyclidine	25	25
Amphetamines	500	
Amphetamine		250
Methamphetamine		250
MDMA		250
MDA		250
MDEA		250

Hair

Analytes and Cutoffs (pg/mg)

Analyte	Initial Cutoff	Confirmation Cutoff
Marijuana metabolite	1.0	0.05
Cocaine Metabolite	500	
Cocaine (parent)		1000
Cocaine metabolite		100
Opiate Metabolites	200	
Morphine		200
Codeine		200
6-AM		200
Phencyclidine	300	300
Amphetamines	500	
Amphetamine		300
Methamphetamine		300
MDMA		300
MDA		300
MDEA		300

Oral Fluid

Analytes and Cutoffs (ng/mL)

Analyte	Initial Cutoff	Confirmation Cutoff
Marijuana metabolite THC (parent only)	4	4
Cocaine Metabolites Benzoylecgonine	20	8
Opiate Metabolites Morphine Codeine 6-AM	40	40 40 4
Phencyclidine	10	10
Amphetamines Amphetamine Methamphetamine MDMA MDA MDEA	50	50 50 50 50 50

Sweat

Analytes and Cutoffs (ng/patch)

Analyte	Initial Cutoff	Confirmation Cutoff
Marijuana metabolite THC (parent only)	4	1
Cocaine Metabolites Benzoylecgonine	25	25
Opiate Metabolites Morphine Codeine 6-AM	25	25 25 25
Phencyclidine	20	20
Amphetamines Amphetamine Methamphetamine MDMA MDA MDEA	25	25 25 25 25 25

Point-of-Collection Test (POCT)

- What is a POCT:
 - An initial test conducted at the collection site; POCT device can be non-instrumented (visual read) or instrumented
- Requirement for a POCT device:
 - Cleared by the FDA
 - Must be included in the HHS Conforming Products List
 - List is published in Federal Register and the HHS website
- Types of specimens to be tested using a POCT:
 - Oral Fluid, Urine

Oral Fluid

- Definition and collection of “oral fluid”
 - Definition of “oral fluid”
 - Section 2.1, 2.5.b
 - Previously has been defined as “the fluid collected by insertion of absorptive collectors into the mouth.”
 - A “neat” specimen may be made of several different components differing to a great extent between individuals
 - Collecting a “neat” specimen is not the best technology available

Oral Fluid

- Collection method: “spitting” versus collection device
 - Section 2.5.b; 7.1.c
 - A lack of dignity in “spitting”
 - An increased collection time component
 - Biohazard – Unsanitary, infectious pathogens
 - Difficulty with this type of collection associated with “dry mouth.”
 - Supported the use of a collection device, providing justification for their use and criteria the devices must meet to be acceptable
 - The donor is unable to control any part of the collection and the entire process is observed, therefore it would be impossible to adulterate and/or dilute the specimen
 - Devices are becoming available that help in the areas of specimen standardization, reliability and integrity

Oral Fluid

- Required volume of specimen
 - Section 2.5.b; 8.3.a.6
 - Disagreed with the 2 mL oral fluid specimen volume requirement (e.g., this exceeds the volume necessary for testing by a competent laboratory and/or is inconsistent with the volume collected by many current collection systems)

Oral Fluid

- Determining volume of collected and split specimens and method of splitting into A and B specimens
 - Section 2.5.b; 8.3.a.8
 - Determining the exact volume of the collected and split specimen would be difficult or impossible
 - It may be difficult to manipulate a viscous sample (i.e., transfer and splitting)
 - Requested specific guidance on how to mix and transfer the oral fluid
 - Recommended that HHS allow the use of 2 collection devices for a split oral fluid specimen collection

Oral Fluid

- Examination of oral cavity and wait time before collection
 - Section 8.3.a.4
 - *“The collector must confirm with the donor that the donor has not had anything in his or her mouth for 10 minutes prior to the collection of the oral fluid specimen” and must wait 10 minutes prior to the collection if the donor says he or she has had something in his or her mouth”*
 - Should have 5 or 10 minute observation period regardless of donor claims
 - Should not have an observation wait period--adds too much time to collection process
 - Observation period should be 30 minutes

Oral Fluid

- Examination of oral cavity and wait time before collection (*continued*)
 - Should have the donor wash/rinse his or her mouth (e.g., 2 minutes prior to collection) instead of requiring a wait period
 - Collector should always inspect the inside of the donor's mouth to ensure there is no object that could interfere with the collection
 - Suggested that HHS expand this section to discuss attempted dilution or substitution of an oral fluid specimen (e.g., hollow tooth, capsule)

Oral Fluid

- Allowable reasons for testing using oral fluid
 - Section 2.2
 - The proposed Guidelines allow oral fluid for pre-employment, random, reasonable suspicion/cause, and post-accident.
 - Comments discussed allowing return-to-duty and follow-up testing
 - Objected to the use of oral fluid for pre-employment testing
 - Objected to the use of oral fluid for random testing

Oral Fluid

- Detection of marijuana use using oral fluid
 - Section 2.3.a
 - The proposed Guidelines require collection and testing of a urine with each oral fluid specimen
 - Disagreed with or objected to this requirement
 - If the oral fluid requirement for a urine specimen to be collected is retained, then oral fluid is not an option for paruretics
 - Objected to the collection requirement based on the additional time and cost that is incurred for the collection, shipment and laboratory timing
 - Objected to the collection requirement based on scientific reasons; comments submitted with and without references

Oral Fluid

- Detection of marijuana use using oral fluid
 - Preamble; Section 3.5
 - Detection of metabolite versus parent drug
 - Stated that there are now confirmatory test assays for THCA, thereby negating HHS's previous concerns over positive THC results due to environmental contamination and eliminating the need for collecting a urine specimen in addition to oral fluid specimen
 - Cited an unpublished Northwest Toxicology study that detected THCA in oral fluid
 - Cited several published articles showing diffusion of THC metabolites into oral fluid from the blood
 - Believes additional study on detection of THCA in oral fluid is needed, preferably with negative ions LC/MS/MS

Oral Fluid

- Oral fluid specimen validity testing
 - Section 3.9
 - Questions need for SVT (oral fluid collections are observed)
 - Recommended addressing specimen validity by having a donor wait 10 minutes at the collection site and having the donor open his/her mouth prior to collection
 - Recommended testing pH of oral fluid specimens, saying there is a commercially available lozenge which alters saliva pH in an attempt to thwart drug testing

Oral Fluid

- Oral fluid specimen validity testing (*continued*)
 - Questions appropriateness of testing for IgG and other SVT
 - Stated that the Guidelines do not explain the meaning, purpose, and rationale for IgG testing and don't give needed specifics on "additional validity testing."
 - Disagreed with testing IgG for oral fluid specimen validity
 - IgG concentrations vary greatly with secretions from various salivary glands; 0.1 µg/mL (the proposed substitution cutoff) would not tell whether a specimen was diluted in vitro
 - IgG concentrations vary in oral fluid related to the condition of the gums and transudate of the donor
 - Presence of IgG only proves that the specimen contains protein; concentrations of IgG to indicate an "undiluted" specimen have not been established

Oral Fluid

- Oral fluid specimen validity testing (*continued*)
 - Disagreed with the IgG testing requirements in the proposed Guidelines
 - Disagreed with testing IgG at the stated cutoff
 - If an IgG test is used, require two separate tests to report substitution as is required for urine
 - Reporting oral fluid specimens with no IgG by immunoassay as “substituted”; 0.30 µg/mL is the current LOD for commercial IgG assay testing
 - Recommended a cutoff of 1.5 µg/mL IgG for substitution, saying this cutoff accounts for a 3-fold dilution using the FDA-cleared oral fluid testing system

Hair

- Allow the use of body hair
 - Section 2.1, 2.5
 - Disagreed with limiting to head hair for the following reasons: collection of body hair is less invasive than observed urine collections or applying and removing the sweat patch, requiring head hair limits the effectiveness of the program by allowing the individual to avoid hair testing by shaving the head, some employers with existing programs say they do not get objections to the collection of body hair from their employees, a fairness issue for women

Hair

- Effect of hair color on drug concentrations
 - Preamble
 - Higher detection levels for some drug users
 - If it is above the cutoff it will be positive regardless of the hair color
 - Believe the hair color bias issue raises racial bias issues, discrimination concerns and is unacceptable
 - Detail flaws in the literature cited in the Preamble on hair color bias and recommend not including a discussion of hair color bias in the Preamble

Hair

- Effect of hair color on drug concentrations
(continued)
 - Disagree with discussion of bias issues in hair unless also discuss bias issues with urine, sweat, and oral fluid
 - Believe there is no hair color effect and cite literature to support
 - Believe there will be challenges “on the basis of racial bias
 - Suggested that melanin concentrations could be measured and drug concentrations in hair be normalized for melanin, and be reported as pg/mcg melanin

Hair

- Contamination from environmental exposure
 - Preamble
 - Environmental exposure
 - The metabolites of PCP and amphetamine are not used as the analytes in hair testing, so possible environmental contamination has not been addressed for these drugs
 - Presence of cocaine metabolites could be hydrolytic products derived from exogenously deposited cocaine

Hair

- Contamination from environmental exposure (*continued*)
 - Effectiveness of decontamination procedures to address environmental exposure
 - recommend standard methodologies for testing, particularly washing of the hair to remove external contamination
 - any study performed without aggressive washing of the hair samples cannot be interpreted to represent ingestion

Hair

- Collection
 - Section 2.5.a, 8.0
 - Required amount of hair and percentage split between A and B specimens
 - Disagreed with the 100 mg sample size; suggested sample size be increased to ensure sufficient quantity for testing; suggested sample size be decreased for aesthetic reasons
 - Suggested maintaining the 100 mg specimen size but splitting it 1:2 or 1:3 because the A lab needs more specimen; suggested a 70:30 split to be consistent with urine and oral fluid specimens

Hair

- Collection
 - Section 2.5.a; 8.2.a.7
 - Collector assessment of proper amount
 - How would the collector determine the weight of hair samples

Hair

- Hair specimen validity testing
 - Section 3.8
 - Question the need for SVT since hair collections are observed
 - Question the appropriateness of validity tests described in proposed Guidelines and other SVT
 - Regularly review products that claim to remove drugs from hair and have found no effective adulterants; no evidence of effective adulterants in the literature
 - Believes criteria are needed for reporting substituted hair specimens

Hair

- Hair specimen validity testing *(continued)*
 - Noted that some validity tests listed (e.g., digestion test, dye test) are not defined and it is unclear what information would be obtained
 - Unrealistic as proposed
 - Trained collectors should be able to distinguish synthetic/substituted hair and eliminate the need for validity tests such as those listed in the Guidelines

Hair

- Confirmatory test cutoff concentration for THCA
 - Section 3.4
 - Suggested that the confirmatory test cutoff for THCA in hair be raised from the proposed concentration of 0.05 pg/mg to 0.1 pg/mg; commenters stated that the higher cutoff concentration was in accordance with current industry practice and with the abilities of laboratories demonstrated by their results in the NLCP Pilot Performance Testing Program for Hair

Sweat

- Environmental exposure
 - Preamble
 - Concern expressed over the possible environmental contamination of sweat patches
 - Have the donor complete a questionnaire “to reveal any contamination concerns” such as chemical hair treatment in last 60 days

Sweat

- Privacy issues with application and wearing of a patch
 - Section 5.7; Section 8.4.a; & Preamble
 - Questions if the collector applying and removing the patch would be required to be the same gender as the donor
 - Expressed concern over stigma to an employee wearing a sweat patch

Sweat

- Length of time to wear a patch
 - Section 2.5.c; 8.4.a.7
 - Guidelines propose 3 to 7 days
 - Studies indicate that the majority of drug appears within the first 24 hours
 - Recommended that HHS specify the number of days for sweat collection

Sweat

- Sweat specimen validity testing
 - Section 3.10; Preamble
 - Appropriateness of testing for lactic acid and other SVT
 - Suggested pH testing for sweat specimens, saying a donor could use a syringe to inject bleach or another high pH solution through the outer membrane of the patch

General: All Matrices

- Fairness to the individuals tested using different matrices
 - Section 2.1; 2.2
 - Drug detection times different among different matrices
 - Relationship of cutoff values between matrices
 - The cutoffs should be set so results of the different matrices were equivalent
 - Expressed concern that it was not equitable to test Federal employees using different matrixes with different detection windows

General: All Matrices

- Guidance for Federal agencies on selection of appropriate matrix
 - Section 2.1
 - Want more detail and guidance provided

General: All Matrices

- Collection procedures in the proposed Guidelines lack sufficient details
 - Section 8.0
 - Include instructions to remove headgear
 - Include guidance for collectors to address religious traditions or customs that might interfere with a head hair specimen collection
 - Include guidance for collectors to check for hair extensions, wigs, and hairpieces, and adding guidance on collector actions in response to these items

General: All Matrices

- Collection procedures in the proposed Guidelines lack sufficient detail
(continued)
- Concern over the use of scissors (i.e., safety of collector, possible donor access to scissors) and suggested that HHS describe appropriate safeguards
- Have the donor complete a questionnaire “to reveal any contamination concerns” such as chemical hair treatment in last 60 days

In Closing

- This was a review of 2004 Proposed Mandatory Guidelines and comments
- Additional Studies will have to be undertaken for Alternative Matrices
- New Forensic Technologies have advanced the science
- The DTAB provides advise to the SAMHSA Administrator and recommends guidance
- DTAB will begin the next steps in the review of the Science of Alternative Matrices

Thank You

- Please visit the Division of Workplace website
- <http://www.workplace.samhsa.gov>
 - Certified Lab List (updated monthly)
 - MRO Manual
 - Specimen Collection Handbook
 - DTAB minutes
 - Meeting Announcements