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PSYCHEMEDICS
CORPORATION

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Re: FR Doc. 04-7984 Proposed Revisions to Mandatory Guidelines For Federal Workplace Drug Testing Programs

Response to the SAMHSA Request for Comments

Psychemedics Corporation submits the following comments to the proposed mandatory guidelines for Federal workplace drug testing programs. Psychemedics began commercial hair testing in 1987 and is currently the largest provider of hair testing services in the world. We have performed millions of hair analyses primarily for workplace testing programs for some of the largest corporations in the country including General Motors, Anheuser Busch and Kraft Foods. Psychemedics' client list includes 11% of the Fortune 500 as well as some of the largest police departments in the country including the NYPD, Chicago PD, Boston PD, San Francisco PD, and LAPD. Over the last fifteen (15) years our testing has been upheld in state and federal courts, military courts, arbitrations and administrative agency hearings. (Attachment 1). Many companies that have found hair testing to be an extremely effective part of their drug testing programs will welcome the inclusion of hair testing into the guidelines. The expansion to include alternate matrices for workplace testing is essential due to the unobserved nature of urine testing as presently performed in the workplace. The hair matrix is particularly needed because of its unique suitability for detecting heroin, ecstasy and PCP use, as well as the fact that poppy seed consumption does not result in opiate-positive hair results. These capabilities of hair testing should be of particular value in workplace settings with highly sensitive positions. We fully support the inclusion of hair as an alternate matrix in the proposed guidelines. There are, however, several areas on which we would like to comment. Our comments follow in the order in which the sections appear in the Preamble and Guidelines.

Preamble

The Preamble notes on page 19675 that drugs and drug metabolites may be incorporated into hair by several different pathways, including from the bloodstream and via secretions of the apocrine sweat glands and sebaceous glands. It also states that, "sweat can be

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responsible for drug incorporation at distal segments of hair which does not correspond to the time of drug ingestion." Incorporation of drug into the hair during growth, before and during keratinization, must be distinguished from external deposition of drug on the keratinized mature hair fiber. Drug found on hair segments not corresponding to time of ingestion is externally deposited drug that can, and must, be largely removed by aggressive washing techniques. (Attachment 2). Without such washing to remove drug that is deposited, rather than incorporated, neither cutoffs nor metabolite criteria will allow consistent interpretation of hair analysis results. It has been shown, for example, that 100% of hair samples from 72 proven cocaine users in a clinical study contained external contamination in amounts ranging from 4 – 2000% of the drug content of the hair after washing. (Attachments 3, 4). We would recommend that the word "incorporation" in the sentence, "sweat can be responsible for drug incorporation at distal segments of hair which does not correspond to the time of drug ingestion" be changed to "deposition" to clarify this point. Additionally, the following sentence needs to be added: "Such deposition needs to be removed or accounted for by validated wash procedures."

The Preamble also states on page 19675: "While washing the hair sample may remove some of the contamination, ultimately we can differentiate environmental contamination from actual use because of the presence of the metabolite which is not present when environmental contamination is the source of drug." This statement is only partially true. When a sample is above the cutoff for incorporated,(not externally deposited), parent drug, there may be certain metabolites that can differentiate with certainty between external contamination and ingestion. Other metabolites present via metabolic processes can also be present via environmental sources and the latter must be removed by aggressive washing in order for their presence to add to the certainty of ingestion. Some drugs may not have metabolite available at all. It is, therefore, the combination of metabolite identification along with washing of the sample, analysis of the wash, and the application of cutoff levels that completely differentiate environmental contamination from actual use. We, therefore, recommend that this section be changed to indicate that, "...ultimately we can differentiate between environmental contamination and actual use because of the presence of metabolites, in combination with effective, validated washing techniques and cutoff levels."

In light of the above, we recommend that a decontamination method include a minimum of three 30-minute washes in aqueous medium to allow swelling of the hair and diffusion of contaminating drug into the wash solution. The aqueous washing should be preceded by a short (e.g., 15 min) wash in an organic solvent to remove non-water soluble substances. Secondly, wherever a definitive metabolite (e.g., cocaethylene or carboxy-THC) is not present, the method should include a measurement of the drug in the wash solution to evaluate the effectiveness of the decontamination. This evaluation requires a highly effective extraction method for the confirmation step—one that recovers most of the drug remaining in the hair due to ingestion.

The Preamble also indicates that the role of hair color is of "major concern" to the Department and cites animal studies and in vitro soaking exercises that show effects of hair color, as well as several human clinical studies indicating that incorporation of some

drugs may be affected by hair color. All of the studies cited that suggest color bias suffer from one or more serious issues, including: (1) extracting hair with NaOH, a method that could never be used for workplace samples because it hydrolyzes 6-monoacetylmorphine and cocaine; (2) failing to adequately wash the hair before extraction to remove sweat and contamination as the source of the measured drug; (3) use of *in vitro* models that mimic soaking/contamination but are not valid models of *in vivo* incorporation into the growing hair fiber within the hair follicle; (4) use of animal models which may not accurately reflect transport and biotransformation processes that occur in humans; (5) extremely small data sets with low statistical significances; and (6) failure to remove melanin.

To illustrate the above issues, there are only three (3) studies cited in the Preamble as "human clinical controlled studies" that show differences in incorporation of codeine (reference 2 in the Guidelines), cocaine (reference 9) and amphetamine (reference 10). A review of these papers indicates that reference 10 is a rat study, not a human study, with an "n" of 8 rats for amphetamine. Even this study, however, indicated that properly set cutoff levels can eliminate any perceived color effect.

Reference 9 in the Guidelines states directly in the abstract that, "...the data are not conclusive because of the relatively small sample size." (An "n" of 9 pooled with an "n" of 6 from a prior study. Additional issues in this study were criticized in subsequent peer reviewed publications – Attachment 8).

Reference 2 in the Guidelines has an "n" of 42 and measured codeine only, without morphine. Hair was solubilized with NaOH and samples were not washed to remove or account for sweat deposited drugs, rendering the concentration amounts meaningless.

None of the referenced studies used methodologies that enzymatically digested the hair or removed melanin, the color component of hair.

The Preamble also refers to population studies in peer-reviewed literature that did not indicate any significant association between hair color or race and drug analyte. The Preamble cites three (3) such studies with over 5,000 data points that show no significant hair color effects.

These citations can be supplemented with additional studies with 1200, 56,000, and 40,000 participants (Attachments 5, 6, 7), as well as others (Attachments 8,9,10, 11). In the first 3 reports (Attachments 5, 6, 7), side-by-side analyses of paired hair and urine tests on the same individuals showed with tens of thousands of samples that the methodology used for the studies provided no statistically significant hair color effects. The hair testing in these additional studies was performed by Psychemedics and included extensive washing, enzymatic digestion of the sample and removal of melanin, the color component of hair.

Initial proficiency testing with hair samples has shown clearly the critical differences created by certain methodologies for some laboratories, especially in washing techniques and extraction methods. Even when washing issues are avoided in the surveys, a number of laboratories' methods were unable to extract even 50% of the drug content of the samples. To accept conclusions in studies regarding quantitative levels of drug in hair from any laboratory that has not demonstrated near 100% extraction efficiency for all types of samples – whether porous or nonporous, fine or thick – and to extrapolate data obtained by such inadequate methods to impute a color effect bias, is completely without merit.

Along with efficient extraction methods, washing of the hair to remove sweat or environmentally deposited drug is the other major component of valid quantitative testing of ingested drug. Any study performed without aggressive washing of the hair samples cannot be interpreted to represent ingestion, much less to assess the presence of a color effect. Considering the issue of sweat alone, it is known that individuals vary greatly in the amount of sweat produced, and that sweat varies depending on gender, exertion, stress, climate and season, hormonal status, clothing, nutritional and hydration states, and many other factors. To compound the uncertainties due to variations in sweat production, the varieties and frequencies of shampoo and conditioner treatments used with different hairstyles may remove these varying amounts of sweat to greater or lesser degrees. Additionally, the effects of an individual's sweat exposure on his/her own hair can vary greatly for different hair types. For example, porous hair may easily soak up hundreds of times more drug than a nonporous hair, but such drug can also be removed with similar ease by effective washing procedures (Attachment 2). Information from studies cited in the Preamble that purport to show hair color effects that have improper or undemonstrated decontamination and/ or extraction methodologies must be weighted accordingly.

What the studies referenced in the proposed guidelines demonstrate is that some methodologies may enhance or even create a hair color effect, while other methodologies avoid it. With tens of thousands of paired hair and urine results showing the same urine and hair positive rates based on hair color, it has clearly been demonstrated that with the methodologies employed in the vast majority of commercial hair testing, either no significant effects are present or any effect of hair color across large populations is identical for urine and hair. It should be remembered that the Federal drug testing program is deterrence based and, for the most part, qualitative, not quantitative in nature. There is absolutely no justification for the Preamble to indicate a hair concern or refer to "suspected limitations" when <u>all of the large population</u> paired-urine and hair data show identical outcomes on the basis of either race or hair color.

The overwhelming preponderance of evidence, with extremely large numbers of samples, performed with methodology that includes aggressive washing and effective extraction, indicates no hair color effect bias.

Even if, however, one were to establish that certain drugs with certain methodologies are affected by hair color, this hair color effect would be no different than the body weight, age, gender, diet and hydration effects that we see with urine. The urine matrix itself has tremendous variations in what drugs are capable of being detected, when they are detected, and for how long. Yet, such urine effects or biases are not mentioned in the guidelines at all. Hair testing is not being added to the guidelines in a vacuum. If there is a concern for normalizing "for effects," then the same concerns apply to urine and other matrices.

Heretofore, the Department has set a cutoff level in its urine program and has not taken into account any of the many areas that can create an effect on the outcome of that result. If the Department is going to broach this area now with hair testing, it will need to do the same with urine and other matrices. If the Department is not going to do this with its urine program, then it is inappropriate to single out effects in one matrix. Accordingly, we recommend that the entire discussion on hair color effects in the Preamble should be deleted. In the alternative, we believe the language, "despite these suspected limitations..." should be changed to: " In light of the large population studies that have consistently shown hair color effects to be non-existent or insignificant with certain hair testing methodologies, the Department proposes to go forward..."

The Preamble on page 19680 also requests recommendations on the use of a single amphetamine test kit or the need to use separate test kits for the detection of MDMA. While the use of separate test kits may be appropriate for urine, Psychemedics' FDA cleared test kit has been shown to detect MDMA with equal sensitivity to methamphetamine in a single kit. We would, therefore, recommend that the use of separate test kits not be required where it would have no benefit.

In section M of the Preamble, the Department proposes a new type of laboratory, essentially a screen-only lab. We believe that IITFs present a potential risk of a loss of integrity to the Federal testing program. Because of the lessened requirements in both personnel and equipment to conduct screening without confirmation, many labs would be able to qualify as SAMHSA-certified facilities with little investment and little liability. On the contrary, confirmatory labs would assume nearly all (if not all) of the risk associated with testing a sample from start to finish. Any related litigation would fall on confirmatory labs, with the IITFs having no stake at all in the outcome. Even more significantly, an IITF could perform virtually no Federally mandated testing and have the bulk of its business be non-Federal testing where the IITF could perform both screening and confirmation. While able to describe themselves as SAMHSA-certified facilities, these ITFF labs could be providing non-SAMHSA screening and confirmation with inadequate methodologies and inadequate instrumentation. This deficient testing would not normally be evaluated in any SAMHSA inspection. The credibility of being a SAMHSA-certified laboratory could be undermined and the integrity of the program would be diminished. Our recommendation would be that if IITFs are permitted, that they be permitted only in conjunction with a full laboratory certification i.e.: a company with a full SAMHSA certification would be permitted to utilize IITFs in remote locations. In

this manner there would be no incentive for fully certified labs to undermine or destroy the SAMHSA program and the risk of an IITF doing substandard testing in the private sector would be diminished substantially.

Guidelines

Section 2.2
Circumstances for the Collection of Different Types of Specimens

Psychemedics supports the use of hair for pre-employment, random, return to duty and follow up. These are the appropriate uses for hair testing and allow hair to be utilized to its greatest benefit.

Section 2.5
Minimum Quantity of Specimen to be Collected

We support the agency's recommendation that 100 mg of head hair, divided as approximately 50 mg per sample, is the appropriate quantity of specimen to be collected. (This amount is more than twice that currently utilized in the majority of workplace testing). However, collector handling of the sample needs to be as minimal as possible to avoid getting the root ends misaligned or turned around. We therefore recommend that the collector take an (A) sample in accordance with the procedures, place the sample in the "(A)" collection container then immediately take the "(B)" sample from approximately the same area. This will reduce the chance of collector error and would be a more workable procedure if a 75/25 procedure were desired. Split samples have been collected in this manner for years. Data on the results of splits is attached. (Attachment 12). Unlike urine where there may be significant variation from one void to another, there is no reason to split the first hair sample, and the above recommendation will minimize collector handling of the sample. We would also recommend that the word, "approximately" be added to the section in front of, "100 mg of head hair," as the actual weighing takes place at the lab, not the collection site.

Section 3.4
Cutoff Concentrations

Psychemedics supports the initial test cutoff concentrations recommended by the agency. We believe the confirmatory test cutoff concentration for marijuana should be raised from .05 pg/mg to 0.1 pg/mg. There appears to be consensus among laboratories that the .05 pg/mg cutoff is too low to maintain in a commercial setting with appropriate controls. Raising the cutoff to 0.1 pg/mg is more in line with the current cutoff used in the bulk of

hair testing performed today and would, when coupled with effective extraction methodology, permit adequate detection rates commensurate or better than urinalysis.

On the confirmation for opiates, note 3 indicates that a specimen meeting the cutoff level for 6-acetylmorphine, must also contain morphine at a concentration greater than or equal to 200 pg/mg. We believe that this should be changed to reflect that a specimen that is positive for 6-acetylmorphine, an absolute marker of heroin use, would need only contain morphine at a concentration above the LOD.

Section 3.8
Required Validity Tests For Hair Samples

Psychemedics believes that validity sample testing is unwarranted for observed collections. One of the benefits of hair analysis compared to urine analysis is that not only is the sample obtained in full view, it is obtained by the trained collector. The observed collection does not give the donor the opportunity to substitute samples. We believe that section 3.8 should be deleted. In the alternative, the laboratory should be able to determine if a sample is valid by conducting one of the validity tests on the list after the test has been validated by the laboratory. Performing all of the validity tests would be overly burdensome and would not add to the program in any meaningful way whatsoever.

Section 3.12
Criteria Used to Report a Hair Sample as Adulterated

Psychemedics regularly reviews products that claim to remove drugs from hair (Attachment 13). Unlike in urine testing, we have found no effective adulterants and there are no published references indicating effective adulterants or tests for adulterants at this time in hair analysis. We recommend that section 3.2 be eliminated. While it may appear reasonable to believe there may eventually be adulterants, at this time it appears that the Department is attempting to address a non-existent problem. It should be noted that hair collection is observed and performed by a collector, reducing the opportunity to adulterate the sample and that it took years for the validity and adulterant issue to become significant enough to address with even unobserved urine collection.

Section 3.19
Criteria to Report a Hair Sample as Invalid

In section 3.9D, the Guidelines state that the primary sample should be called invalid if the physical appearance of sample (A) and (B) are clearly different. Differences between the A sample and B sample would not be apparent, however, as the B sample would be sealed and not opened unless the A sample was positive. If the A sample was positive, a different lab would be opening the B samples. We believe that information on the color and length of the A sample should be sent to the second lab whenever a B sample is

forwarded. There is no way for the laboratory testing sample A, however, to inspect the physical appearance of sample B.

Section 4.2
Requirement to Be a Trained Collector

We believe that item (a) requiring collectors to read and understand the guidelines in their entirety is overly burdensome. The collectors should need to read and understand the guidelines as pertains to their functions as collectors.

Section 4.1, 5.1 & 5.5
Limitation to Head Hair

The Preamble indicates that head hair would be the only hair sample allowed. The rationale behind the Department's restriction is that head hair is the least invasive area to collect the hair sample and affords the donor the most privacy. The Preamble notes: "The Department believes it is more appropriate to conduct a drug test using a different specimen rather than attempting to collect hair from another body site."

This privacy concern with hair becomes unreasonable when the rest of the guidelines are reviewed. Sweat patches can be applied to an arm, back, or chest, and observed collections, are allowed for urine testing. Certainly, an observed urine collection is far more intrusive than collecting hair from an arm. In order to be consistent in eliminating any invasive collections the Department would have to disallow the application of sweat patches on arms and chests as well. Additionally, observed (and perhaps unobserved) urine collections would no longer be permissible. It should be remembered that all urine testing, observed and not observed, involves the genitals. Hair testing could be limited to head hair, arm, leg, underarm, or chest hair, without ever involving the genital region for any collection.

Body hair collections have been performed in private industry without issue for years (most corporations simply eliminate pubic hair). When body hair is limited to sites other than pubic hair, the collection of these samples is less intrusive than urine testing. If the Department felt it absolutely necessary for privacy reasons, the collection of arm or chest hair could be performed by the donors themselves under direct observation and would still be certainly less intrusive than observed urine collections. The proposed elimination of body hair would allow donors to "game" the system by shaving their heads to purposely obtain the shorter detection window of urine or saliva which would be more likely to be negative or could be timed, or to avoid detection of heroin, ecstasy or PCP use for which hair is the optimum matrix. This would have a detrimental effect on the integrity of the program.

For the above reasons, Psychemedics believes that the limitation of hair collections to head hair should be changed and body hair, with the exception of pubic hair, should be allowed to be collected as is currently done in non-regulated testing.

Section 8.2
Collection of Head Hair Sample

The guidelines indicate that evidence of lice will require stopping the collection procedure and obtaining a different type specimen. We believe that the concern should be more general and be applicable to all matrices i.e.: "If collection of a sample is problematic and/or the collector believes an adequate or appropriate sample cannot be obtained, the collector may obtain a different type of sample." This more general statement, applying to all matrices, could take into account lice, shy bladder, dry mouth, and skin that the patch will not stick to.

Section 8.2 (a) 8

The test reads "The collector places the head hair in the foil ...with the root end extending out ...the slated end of the foil." The word "slated" should be "slanted."

Section 8.2 (a) 9

The collection procedure indicates that the collector folds both foils length-wise and each sample is placed in an envelope with root ends to the left. The indication of root ends going to the left is unnecessary; the collector simply needs to place the sample foil in the envelope.

Section 9.3
Process to Become Certified

Psychemedics recommends that the word "applicable" be inserted in front of "guidelines" so that the requirement of a laboratory, or IITF, to become certified is that they "Read and understand these applicable guidelines." As pointed out earlier, it is not necessary for a laboratory that is certified in urine to necessarily understand the procedures regarding sweat and vice versa.

Section 9.5 (a) (2)&(3)
Specifications of PT Samples

Because of the low levels of drugs found in hair, we recommend that the concentration of a drug or metabolite be at least +/- 50% of the cutoff concentration for the screen and +/- 25% for confirmation.

Section 9.6 (6), (7), (8)

See previous comments on validity and adulteration.

Section 9.10 (a) (8)(9) & (10)

See previous comments re: validity tests

Section 11.12
Requirements for Initial Drug Test

Psychemedics supports the requirement that drug test kits meet FDA requirements for commercial distribution. As more and more laboratories enter the field of alternative matrices and/or develop tests for urine, there needs to be a mechanism to insure accuracy and reliability. FDA has served in this capacity since 1987 with the urine program, and we support its continued inclusion in the requirements.

Section 11.14(a) (2) &(3)
Batch Quality Requirements When Conducting an Initial Drug Test

Because of the low levels found in hair analysis as compared with the urine matrix, we would recommend that 11.14 (2) & (3) be amended to allow controls with drug or metabolite targeted at +/- 50% of the cutoff.

Section 11.15
Requirements for a Confirmatory Drug Test

Psychemedics agrees with the agency in 11.15(a) that validated triple quad mass spectrometry analysis is not only appropriate, but for some analytes, the most effective instrument available.

Section 11.18 and Section 11.22
Analytical and Quality Control Requirements for Conducting Validity Tests on Hair Samples

See above validity test comments

Section 15.1
Split Specimen Testing

Section 15.1(c) states that if split specimens cannot be tested due to insufficient specimen or a lost sample, the MRO can direct the Federal agency to collect another specimen. We support this inclusion in the regulations. We agree with the agency and support the ability of the MRO to order the collection of another specimen. While in some instances the donor may have taken evasive maneuvers to avoid a positive result, in other instances this may not be possible and it provides at least an opportunity to corroborate a first specimen should there be an issue with the split sample.

Section 15.3
Testing Split Hair Samples for Adulterants When the Primary Sample is Reported Adulterated

This section would need clarification as there are no known adulterant tests in the literature for hair testing or any demonstrated effective adulterants.

The proposed revisions to the Mandatory Guidelines for Federal Workplace Drug Testing Programs that contain provisions for hair, oral fluid, and sweat testing can only serve to enhance the effectiveness of the drug testing programs that have been in existence with urine. It is in the public's best interest to provide employers and agencies with all the tools available to deter drug use in the workplace. The agency's efforts in this regard are not only appropriate, but essential.

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List of Attachments

Attachment 1: Federal, State, and Military Court Rulings.
Arbitration and Administrative Agency Hearing Results

Attachment 2: Cairns, T., Hill, V., Schaffer, M., Thistle, W.: Removing and Identifying Drug Contamination in the Analysis of Human Hair, in press, *For Sci Int*

Attachment 3: Schaffer ., Hill, V., Cairns, T.: The Requirement for Effective Wash Procedures for hair testing and the Application of A Wash Method to Samples Soaked in Cocaine Solutions of 1 to 50 ug/mL, Accepted for Presentation at SOFT, September 2004 (Abstract)

Attachment 4: Cairns, T., Hill, V., Schaffer, M., Thistle, W.: Levels of Cocaine and Its Metabolites in Washed Hair of demonstrated Cocaine Users and Workplace Subjects. in press, *For Sci Int*

Attachment 5: Mieczkowski, T., and Newel, R. An Evaluation of Patterns of Racial Bias in Hair assays for Cocaine: Black and White Arrestees Compared. *Forensic Science International* 63 (1993) 85 – 98.

Attachment 6: Mieczkowski, T., Lersch, T., and Kruger, M. Police Drug testing, Hair Analysis and the Issue of Race Bias. *Criminal Justice Review* 27 (2002) 124-139.

Attachment 7: Mieczkowski, T., and Kruger, M. Assessing the Effect of Hair Color on Cocaine Positive Outcomes in a Large Sample: A Logistic regression on 56,445 Cases Using Hair Analysis. *Bulletin of the International Association of Forensic Toxicologists* 31 (2000) 9 – 11.

Attachment 8: Mieczkowski, T., and Newel, R. An Analysis of the Racial Bias Controversy in the Use of Hair Assays, in Mieczkowski, T., ed., *Drug Testing Technology*, CRC Press, Boca Raton, pp. 313 – 348.

Attachment 9: Mieczkowski, T. Effect of Color and Curvature on the Concentration of Morphine in Hair Analysis. *Forensic Science Communications* 3 (2001) 1 – 11.

Attachment 10: Mieczkowski. T. The Further Mismeasure: The Curious Use of Racial Categorizations in the Interpretation of Hair Analysis, *Int. J. Drug Testing*, 2 (2000) 1 – 20.

Attachment 11: Mieczkowski, T., Is a "Color Effect" Demonstrated for Hair Analysis of Carbamazepine? *Life Sciences* 67 (2000) 39 – 43.

Attachment 12: Psychemedics Results of Cocaine and Carboxy-THC Analyses of Duplicate Hair Samples

Attachment 13: Hill, V., Schaffer, M., and Cairns, T. Internet-Advertised Drug-Removal Products: Effects on Cocaine, Opiates, and Carboxy-THC in Hair, manuscript in preparation