CASE REPORT

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Recovery of Latent Prints and Drug Residues from a Problem Porous Surface

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ABSTRACT: A protocol to maximize the probability of recovery of both drug residues and latent prints has been previously reported. A particular type of substrate (paper) has been encountered which traps drug residues in the paper matrix, thereby preventing recovery by the methods previously reported. In the case in which the existing protocol fails to recover drug residues, an additional technique is described which has allowed recovery of confirmatory amounts of the drug. The technique consists of sonication of the substrate in methanol after latent print processing.

KEYWORDS: forensic science, cocaine, drug residues, spectroscopic analysis fingerprints, mass spectrometry, latent prints

A previous paper [*1*] described results of experiments in which drug residues and latent fingerprints were deposited on a wide variety of porous and nonporous surfaces. The protocol sought to optimize the possibility that both drug residues and latent prints could be recovered.

Several related cases were subsequently received at this laboratory which contained squares of white paper. Individual fiber structure could be observed, the paper appearing to be minimally "sized." No specific identification of the paper was attempted however. Neither swabbing nor subsequent soaking released detectable amounts of drug residue. When the protocol failed to reveal the presence of drug residues, the papers were reexamined. The new procedure yielded sufficient amounts of drug residues for confirmatory identification. The drug residue identified in this particular case was cocaine.

Materials and Methods

Methanol (MeOH) (glass distilled OMNI-SOLV) was obtained from EM Industries. Sonication was performed using a Mettler Electronics Corp. (Anaheim, CA), model ME 2.1 ultrasonic cleaner. Evaporation of the methanol was performed using a Buchi/Brinkmann

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Instruments (Westbury, NY) model W240 Rotavapor® rotary evaporator. Gas chromatography/mass spectrometry (GC/MS) was performed using a Hitachi 663-30 gas chromatograph interfaced to an ELQ 400-1 mass spectrometer.

Ninhydrin: Freon 113 (1/2%) [2] was used to conduct latent print examination.

The established protocol [1] was initially followed. After MeOH swabbing/soaking to recover drug residues, the papers were subjected to latent print examination using ninhydrin (1/2%). The papers were individually saturated by pipetting fresh solution onto the surface of each paper using a disposable Pasteur pipet. The amount of ninhydrin reagent was carefully controlled to allow for total saturation, with minimal runoff. Excess ninhydrin was collected and disposed of.

It is necessary to treat the papers individually with fresh ninhydrin reagent to eliminate the possibility of cross-contamination. This procedure maintains the integrity of the evidence in the case where only a portion of the papers yield latent fingerprints of a particular individual.

Latent fingerprints were subsequently developed on a number of the paper squares; it was also determined that the previous drug sampling technique has failed to recover detectable amounts of drug residues.

The developed latent prints were preserved photographically and the areas containing the latent prints were cut out of the individual papers. The remainder of the paper squares were then placed in the sonicator in 300 mL of MeOH and sonicated for 5 min. Note that only those paper squares which contain latent prints of the same individual should be processed together to maintain the integrity of the evidence. In the case where the maker of the prints is unknown, this may entail sonication of each item separately.

During sonication, the majority of the purple amino acid: ninhydrin complex which appeared on the papers being sonicated was dissolved in the MeOH. For this reason, preservation of those areas containing latent prints is essential. Subsequent experimentation suggests that sonication of undeveloped latent prints would also destroy the friction ridge impressions. For this reason, it is imperative that latent print examination precede sonication.

The MeOH was transferred to a boiling flask and reduced to a volume of approximately 15 mL by rotary evaporation. Further reduction in volume, if necessary, was done by evaporation over heat.

GC/MS samples were prepared in two ways: some samples were directly injected or an acid base extraction in chloroform ($CHCl_3$) (sulfuric acid/sodium carbonate [H_2SO_4/Na_2CO_3]) was performed, and the base fraction was reduced in volume and injected. For either procedure, strong confirmatory spectra were obtained with sufficient material remaining to allow for reanalysis. The "neat" samples exhibited no interference or masking as a result of the presence of Ruhemann's purple or unreacted ninhydrin.

Conclusion

It is possible to obtain confirmatory GC/MS spectra from amounts of drug residues (in this case, cocaine) which were not recovered by MeOH swabbing/soaking after ninhydrin: Freon 113: MeOH: ethyl acetate treatment. This was accomplished using sonication. Sonication released drug residues which were trapped in the paper matrix.

Latent print examination must precede sonication, and areas containing latent prints should be cut out since sonication destroys the latent print impressions. Ninhydrin should be applied by pipetting, using fresh ninhydrin to ensure that no cross-contamination occurs.

Rotary evaporation was used to expedite the reduction in volume of the methanol solution, but this is not a requirement for this procedure.

To date, we have found this particular paper to be unique in its ability to trap drug residues in its matrix, and for that reason the above procedure should be considered an exception to the established procedure reported elsewhere in this issue [1]. This report is not intended to identify a specific paper for which the procedure reported herein should be

invoked; rather, it is intended as a procedure of last resort when the established procedure yields negative results for any substrate.

Because it is straightforward and yields results in the majority of cases when dealing with porous surfaces, the original protocol is recommended. In cases where initial attempts fail to reveal drug residues, the above described procedure may yield positive results.

References

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